UNIVERSITY OF ESWATINI

FACULTY OF COMMERCE

DEPARTMENT OF BUSINESS ADMINISTRATION

MAIN EXAMINATION

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TITLE OF PAPER: OPERATIONS MANAGEMENT 11

DEGREE AND YEAR: Bachelor of Commerce III

COURSE NUMBER: BUS 432 F/T and BA439 / BA 507 (IDE)

TIME ALLOWED: Three (3) hours

INSTRUCTIONS

1. THIS PAPER CONSISTS OF SECTION (A) AND (B)
2. THE CASE STUDY SECTION (A) IS COMPULSORY
3. ANSWER ANY THREE QUESTIONS FROM SECTION B

Special Requirements: Calculator, Ruler, Pencil, Rubber

Note: You are reminded that in assessing your work, account will be given of the accuracy of language and the general quality of expression, together with the layout and presentation of your final answer.

THIS PAPER MUST NOT BE OPENED UNTIL THE INVIGILATOR HAS GRANTED PERMISSION.

GOOD LUCK!!!

SECTION A CASE: COMPULSORY

CASE STUDY. CAREFULLY READ THE CASE STUDY BEFORE ATTEMPTING TO ANSWER THE CASE STUDY QUESTIONS.

When you think of a hospital, what comes to mind? Patients, emergency rooms, technology and medical advancements. Making the sick and injured well again. When officials at Virginia Mason think of hospitals, they think of cars. A car manufacturing plant, to be exact. Beginning in 2000 the hospital's leaders looked at their infrastructure and saw it was designed around them, not the patient, said Dr. Gary Kaplan, Virginia Mason's chairman and chief executive officer. F or example, you hurry up and be on time, only to wait for the physician to see you. They began looking for a better way to improve quality, safety and patient satisfaction. After two years of searching, they discovered the Toyota Production System, also known as lean manufacturing. Developed in part by Japanese businessman Taiichi Ohno, the idea is to eliminate waste and defects in production. Virginia Mason has tailored the Japanese model to fit health care. Kaplan and other Virginia Mason managers took their first trip to Japan in 2002 where they visited manufacturing plants such as Toyota and Yamaha.

Nearly 200 employees have toured plants in Japan and a ninth trip is planned for this summer. While Virginia Mason couldn't say exactly how much they paid over the years to send the staff overseas, officials liken it to leadership training other companies pay for their employees. They say the benefits offset the costs. "'People are not cars' is very common for me to hear," Kaplan said. We get so wrapped up in the seriousness and specialness of health care, but we also have to open our eyes to other industries—we're way behind in information specialists and taking waste out of our process.

Toyota is obsessed with the customer and customer satisfaction . . . all those things Toyota was about was what we wanted." So what does that mean? There are seven wastes, according to the production system. One is wasting time, such as patients waiting for a doctor or for test results to come back. Others are inventory waste—having more materials and information than is necessary—and overproduction waste, producing more than is necessary. Take, for example, stockpiling brochures and pamphlets in storage closets. They take up space. There is wasted cost to make so many pamphlets that aren't needed. The hospital and all of its campuses in the Seattle area implemented a Kanban system, which signals the need to restock. Kanban, which means "visual card" in Japanese, uses exactly that—a card put near the bottom of a pile of tongue dispensers, gauze strips or brochures, for example.

When a nurse or physician sees the card, he or she knows it's time to refill. Supplies don't run out, but they also aren't over-ordered. The hospital created standardized instrument trays for surgeries and procedures, which saved several hundred dollars by no longer setting out extra instruments no one used. Unused but opened instruments have to be thrown away. It takes a series of simple steps to make improvements, said Janine Wentworth, an administrative director who returned from a two-week trip to Japan last month. One example is the development of a flip chart showing the level of mobility in physical therapy patients. The chart shows the appropriate picture of what the patient can do, and each nurse or physician who comes in the room doesn't have to waste time searching charts or asking questions.

Wentworth also wants to implement a production plan to hire more staff before a shortage exists based on turnover rates on any given hospital floor. Another adaptation from the Toyota model is a patient safety alert system. At the manufacturing plant, if there's a problem, the whole line is stopped and the problem is fixed immediately. Virginia Mason's practice had been to identify and fix problems after the fact, perhaps leading to mistakes recurring many times before a solution was found. The alert system allows nurses and physicians to signal a problem when it happens and fix it immediately. Virginia Mason's Kirkland site has about 10 alerts each day. The Kirkland campus implemented the Toyota model in 2003. They've reduced appointment and telephone delays by having medical assistants handle incoming calls, instead of medically untrained operators.

Also, instead of doctors waiting until the end of the day to go through a stack of patient records, they now write comments and recommendations immediately after seeing the patient before going to see the next one. The time saved increases the time a physician can spend with a patient. Dr. Kim Pittenger, medical director at Virginia Mason Kirkland, said most of the cost of medical care involves clogs in the flow of information—paper forms, lab results, phone messages, often leading to irritated patients. Working the backlog down costs more than if you never let things pile up in the first place, he said.

He said not everyone has agreed with the new system and a few physicians have left Virginia Mason because of it. " To some it seems like obsessive-compulsive disorder run amok, but it's part of a solution that eliminates mistakes," Pittenger said. Other hospitals, including Swedish Medical Center, have incorporated the lean system into parts of their operation. Virginia Mason said overall benefits include an 85 percent reduction in how long patients wait to get lab results back, and lowering inventory costs by $1 million. They've redesigned facilities to make patient and staff workflow more productive. The hospital reduced overtime and temporary labor expenses by $500,000 in one year and increased productivity by 93 percent. While direct cost savings aren't passed on to patients with the new system, less waiting, increased safety and more efficient care are.

Kaplan's vision is to have patients start their appointment in the parking garage with a smart card that triggers their entire appointment process. No more waiting rooms, just move directly from the garage to an examination room. Total flow—no waiting, no waste and it's all about the patient. "We have more than enough resources in health care," Kaplan said. "We just need to stop wasting it and only do what's appropriate and value-added and we'd save billions."

Source: Cherie Black, "To Build a Better Hospital, Virginia Mason Takes Lessons from Toyota Plant," Seattle Post-Intelligencer, March 15, 2008.

QUESTION 1 Read the case and answer the questions thereafter

1. What are the wastes identified by the hospital management in their health facility? **[15 MARKS]**
2. What approaches did the hospital management embrace to address these wastes using Toyota way? **[15 MARKS]**
3. What are some of the main obstacles that must be overcome in converting from a traditional system to lean? **[20 MARKS]**

SECTION B (Anwer any 3 questions from this section)

QUESTION 2

Quality control is the process that evaluates output relatives to a standard and takes corrective action when the output does not meet the standard. Quality assurance relies on the inspections of batches of previous produced items refers to acceptance sampling. Inspection adds to the costs of the product or service and therefore it is important to restrict inspection effort.

Identify and discuss five areas where to inspect in the manufacturing process? **[20 MARKS]**

QUESTION 3

Aggregate planning for manufacturing and services share the similarities in some respects, but there are important differences.

a) Identify and discuss four differences between aggregate planning for manufacturing and service planning **[16 MARKS]**
b) Identify and define two inputs and two output of master scheduling process **[4 MARKS]**

QUESTION 4

A teller at a drive-up window at a bank had the following service times (in minutes) for 20 randomly selected customers:

SAMPLE			
1	2	3	4
4.5	4.6	4.5	4.7
4.2	4.5	4.6	4.6
4.2	4.4	4.4	4.8
4.3	4.7	4.4	4.5
4.3	4.3	4.6	4.9

a) Determine the mean of each sample. [4 marks]

b) If the process parameters are unknown, estimate its mean and standard deviation. [2 marks]

c) Estimate the mean and standard deviation of the sampling distribution. [2 marks]

d) What would three-sigma control limits for the process be? [2 marks]

e) Construct control charts for means and control charts for ranges using the attached Table in APPENDIX A. Are any samples beyond the control limits? If so, which one(s)? [7 marks]

f) Explain why the control limits are different for means in parts *d* and *g*. [3 marks]

[20 MARKS]

QUESTION 5

List and briefly explain

a. The dimensions of service quality. **[10 MARKS]**

b. The dimensions of product quality **[10 MARKS]**

QUESTION 6

a) John Deere, the well-known tractor supply company, bolstered profits during a recession by using a JIT approach to reduce inventory levels. However, when demand picked up as the economy strengthened, a shortage of parts led to stretched-out delivery dates. Long lead times to replenish parts meant that in some cases harvesting equipment farmers wanted wouldn't be available until after harvest time! As a result, some farmers turned to Deere competitors to purchase needed equipment. What are the key benefits and risks of a lean system? **[20 MARKS]**

APPENDIX A: Table Factors for three-sigma control limits for $\bar{x}$ and R charts

Number of Observations in Sample, n	Factor for Chart, A_2	FACTORS FOR R CHARTS: Lower Control Limit, D_3	FACTORS FOR R CHARTS: Upper Control Limit, D_4
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2.00
7	0.42	0.08	1.92
8	0.37	0.14	1.86
9	0.34	0.18	1.82
10	0.31	0.22	1.78
11	0.29	0.26	1.74
12	0.27	0.28	1.72
13	0.25	0.31	1.69
14	0.24	0.33	1.67
15	0.22	0.35	1.65
16	0.21	0.36	1.64
17	0.20	0.38	1.62
18	0.19	0.39	1.61
19	0.19	0.40	1.60
20	0.18	0.41	1.59

Source: Adapted from Eugene Grant and Richard Leavenworth, *Statistical Quality Control*, 5th ed. Copyright © 1980 McGraw-Hill Companies, Inc. Used with permission.