

EXAM PRODUCTION PLANNING & QUALITY CONTROL

01-07-2016 09.00-12.00

Please take note of the following:

- This exam consists of three main questions. Many questions have several sub questions indicated with (i), (ii), etc. Make sure to address them all explicitly and note on your paper which sub question you are addressing
- You are required to answer all questions *in English*
- ***You are required to answer each question on a separate sheet.***
- Please mark all of your material clearly with name and student number.
- Books and dictionaries are not allowed.
- **No toilet visits** are allowed during the exam (this is faculty policy which must be enforced).

QUESTION 1: GENERIC TOPICS (45 POINTS)

- (a) List the seven types of waste initially recognized by Toyota. (6 points)
- (b) A goal of Lean Production is to identify and eliminate waste. Nicholas describes a set of guiding lean principles through which waste reduction can be realized. Mention five of these principles (7 points).
- (c) (i) Mention one kind of waste that is caused by large lot sizes. (ii) Mention one kind of waste that is caused by small lot sizes. (4 points)
- (d) What are, according to Nicholas, advantages of simplifying setups? Mention at least 4 reasons. (7 points)
- (e) Nicholas describes how Pike and Cohen contrasted Kanban with MRP. Describe their findings for the following aspects: (i) Timing (time when production or transfer of batches is signaled), (ii) Batch Size (size of production batches and order shipments), (iii) Priorities (basis for priority of orders when there are multiple orders for production and/or shipment), and (iv) Interference (procedure for handling unanticipated orders that require immediate attention). (7 points)
- (f) What is the purpose of a conveyance Kanban card? Make sure that your answer is more specific than 'a card to convey something'. (3 points)
- (g) A manufacturer produces 400 units of product X per day of 8 hours. They use a two-card pull system. Each product X needs two components A, one component B, and three components C. The container size of component C is 50 pieces. Transportation of a full container of C takes 30 minutes. Transportation of the conveyance card itself takes 5 minutes, and the combined waiting time of the conveyance card (upstream and downstream) is 60 minutes. Total waiting time for the production card of C is 1 hour. Production of C takes 5 minutes per piece. Setting up the machines to produce a batch of component C takes on average 30 minutes. The organization uses a 20% safety factor. Calculate the number of conveyance and production Kanban cards needed for component C (reminder of the basic formula: $K = D(P+C)(1+X)/Q$). (11 points)

QUESTION 2: QUALITY IN SERVICES (35 POINTS)

Each question is assessed by a different lecturer. Only answers that start on a new sheet will be assessed! So please start your answer to this question on a new sheet (not on a new page on the sheet of question 1).

- (a) Explain the difference between a customer perspective on quality and a process perspective on quality (7 points).
- (b) Do you agree or disagree with the following statement:

100% inspection proactively ensures quality of products.

Please explain your answer (7 points).

- (c) Would statistical process control (SPC) be a feasible quality control measure in services? Please explain your answer and in your explanation show that you understand the particular characteristics of SPC and services (7 points).

Read the following case description and answer the following two questions, d and e, based on this description

Recently, a new restaurant opened in Groningen. The restaurant sells dishes that are produced with local ingredients only. It does so since it aims to provide its customers a sustainable dining experience. At the same time the restaurant wants its customers to get more familiar with regional dishes, and thereby feel more attached to the region of Groningen and its local traditions. Since the restaurant recently opened, it is looking for ways to get more well known. In order to attract new customers, the restaurant manager decides to leave on the lights in the restaurant throughout the night so that people walking by can look inside 24/7 and see the nice atmosphere inside the dining space. In the first two months after the opening the restaurant indeed attracts many customers, and customers even return after a couple of weeks for a second dinner. Also, every week, the manager welcomes new customers that have heard from other guests about the good food that is served by the restaurant.

- (d) Four elements of the service package are included in the case description. Explain for each element what it is about in general and how this element is operationalized in the case example (9 points).
- (e) Explain which of the elements described in the case description is not designed completely in line with the goals? Provide argumentation for your choice. In addition, propose what the organization should do to bring this element in line with the other elements/goals (5 points).

QUESTION 3: LEAN IN HEALTHCARE (20 POINTS)

Each question is assessed by a different lecturer. Only answers that start on a new sheet will be assessed! So please start on a new sheet (not on a new page on the sheet of question 2).

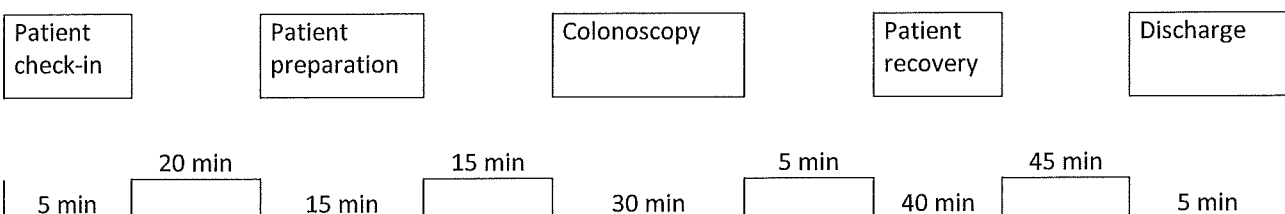
- (a) In the lecture of Kees Ahaus, he discussed based on the contributions of Litvak and Long (2000) and Hopp (2008) the concepts of variability and buffers. The proposition is that reducing variability and buffers is the next stage in lean thinking after having considerable experience with direct waste reduction.
Discuss briefly the concepts of variability and buffers (7 points)
- (b) Explain how variability and buffers can interact (4 points)

Read the following case description and answer the following question (c) based on this description
A colonoscopy is a test that allows the doctor (a gastroenterologist, in Dutch: Maag Darm Lever arts) to look at the inner lining of the large intestine (rectum and colon, in Dutch: dikke darm). He or she uses a thin, flexible tube called a colonoscope to look at the colon. The colonoscope is a thin, flexible tube that ranges from 125 to 183 cm long. A small video camera is attached to the colonoscope so that the doctor can take pictures or video of the large intestine.

A colonoscopy helps find ulcers, colon polyps, tumors, and areas of inflammation or bleeding. During a colonoscopy, tissue samples can be collected (biopsy) and abnormal growths can be taken out. Colonoscopy can also be used as a screening test to check for cancer or precancerous growths in the colon or rectum (polyps).

In 88-97% of all colonoscopies the doctor was able to screen the whole large intestine. There are significant differences between doctors in their ability to screen the whole large intestine.

In the following value stream map the patient journey is depicted for colonoscopies.



The colonoscopy room needs a team of a doctor and two nurses. One of the doctors of the department is involved in the colonoscopy and the same doctor is responsible for the discharge. In the discharge the doctor informs the patients of his or her first assessment, which is a provisional diagnosis as the collected tissue samples need further investigation. This is done by the laboratory and takes an additional week. The doctor completes several colonoscopies before the discharge of a batch of patients can take place.

The clinic operates 10 hours a day, the current demand is 12 patients per day. The number of colonoscopies is rapidly growing to 20 patients per day due to the ageing population. Patients who undergo this screening are on average 61 years (SD 16 years).

(This case description is based McLaughlin and Olson, 2012; Van Lelyveld, Van Oijen and Schwartz, 2012).

- (c) Give an advice based on your analysis of this process to the head of department including at least three improvements (9 points).

