[SV 12] APPLICATION OF PROCESS CAPABILITY AT PERPUSTAKAAN SULTANAH BAHIYAH (PSB)

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ABSTRACT

Library is a place for people to read, collect data from another researchers and services that provided by the librarians and much more. The aim for this study are to know the level of PSB service when dealing with customers and to determine whether PSB continuously do their improvement in their services activities and management. In this study, application of process capability was used to measure latest services that provided by PSB. Process capability used to appoint the results and it was a technique to determine how well a process and whether it meet its details specification. It also to ensure the improvement that was done by PSB from few years before until now. The study founded out that connection between customer satisfaction and library services has strong relationship because without customers or users, library would not need to improve their services from time to time. Alongside that, feedback of users experience also play an important role to achieve the objective of the study. The findings of this study show that their services not capable yet and they are trying to improve their services. Authority of library should encourage their customers to voice out their feedback for their improvement later.

Keywords: *Perpustakaan Sultanah Bahiyah (PSB), process capability, continuous improvement*

INTRODUCTION

According to Duncan as Nelson Mandela (2013) said that education is the most powerful weapon we can use to change the world. In context of nation national development, Ministry of Education on 2012 want to increased public and parental expectations of education policy for Malaysia's children needs in 21st century which will based on Key Performance Index (KPI) or National Key Result Area (NKRA). Increasing quality of graduates rather quantity is one of Ministry's goal for higher education. Now, 75% employability of graduates and Ministry urge to increase to 80% in 2025. Improve and increase knowing of knowledge is one of Ministry's aspiration for students especially in higher education.

By the time, library is a place where people can read any books collected worldwide to improve and enhance their knowledge. Furthermore, along the long journey of history, library is a place where people all around the world will gather and read a book to gain knowledge. Even history told us that a wise leader will keep a track about their nation or journey of live for their next generation so that they will and can learn from history, be better than before and know the important of existence of library. Living in

21st century whereas technology of Wi-Fi, laptop, smartphone and equivalent become part of human daily life and whether it effect function of a library. Nowadays, everything want to be fast and efficient and at the same time we want to measure customer satisfaction and what we can do to improve it.

According to Cambridge Dictionary (2016) definition library is a building, room, or organization that has a collection, especially of books, for people to read or borrow, usually without payment. From this activity, what kind of improvement that a librarian can do to measure customer satisfaction of how far the resources in library can help a borrower to get an information that they desire of. Satisfying the expectations of library customers is one of the organization's goal performance. Various methods of monitoring can be used and by using process capability in this process of control in Perpustakaan Sultanah Bahiyah (PSB) is to determine whether the services provided meets the specifications needed by customer. Basically main components of services are physical product, service product, service environment and service delivery (Chand, 2016). This article will determine ongoing quality improvement at PSB using process capability analysis.

APPLICATION OF PROCESS CAPABILITY

Existence of defect or cause for organization's performance effect many aspect of achievement. Improving services is an important things in increasing goal performance. Process capability reflect the enforcement of a process to determine whether it is in statistical control and being determined by the existence of total variability which is common cause that present in the monitoring system (Mitra, 1998).

To continuing monitoring improvement, process capability analysis used to estimates process capability which involving mean and standard deviation (Mitra, 1998). At the same time also use for calculate proportion of nonconforming product using design specifications in natural variations which consist of materials, machines and tools, method, operators and environment (Evans, 1991).

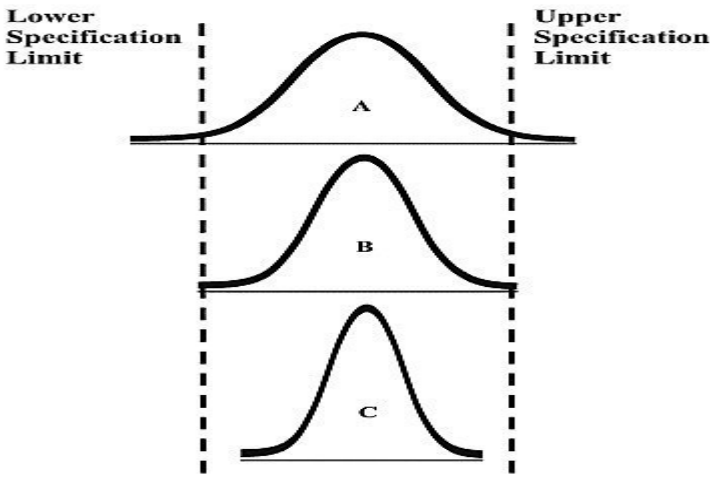

Figure 1

From figure's illustration above,
A Cp < 1: Six-sigma process spread is greater than the tolerance.
B Cp = 1: The six-sigma process spread is equal to the tolerance.
C Cp > 1: The six-sigma process spread fits inside the tolerance with room to spare.

The larger standard deviation means that the natural variation is greater.

- Natural variation is larger than the tolerance spread, Cp will be less than 1.0 (Cp<1).
- Natural variation is equally with the tolerance spread, Cp will be 1.0 (Cp=1).
- Natural variation is smaller than the tolerance spread, the value of *Cp* is greater than 1.0 (Cp>1).

(Source: Kapadia, 2000)

OBJECTIVES OF THE STUDY

This article is about application of process capability at Perpustakaan Sultanah Bahiyah (PSB). The purpose for study stated below:

1. What are the level of PSB service?
2. How to measure PSB services capability?
3. Determine and recognize PSB services capability.
4. Determine whether PSB service is continuous service improvement or not.

METHODOLOGY

According to Walfish (2015), process of capability analysis is to ensure the output of in-control process to the specification limits. The comparison is made by forming the ratio of spread between the process of specifications (the specification "width") and the spread of the process value, as measured by process standard deviation. A capable process is one where almost all the measurement fall inside the specification limits. Pyzdek (1985) stated that, this analysis is to do prediction, so it can only be obtained after it is verified the process in statistical control.

Data for this study was collected from 100 students of School of Technology Management and Logistics from 1163 students using quantitative method but 3 of collected data were missing. There are certain reasons why the questionnaires were downsize to 100 only. Using questionnaire as the main research designs for this study, data able to be collected to achieve goals. The questionnaire consist 2 part, A and B. Part A is for background and part B is for user library services to library resources to determine whether customer satisfy or not with the library services.

RESULTS

Data presentation

The results (average) of the study application of process capability are summarized in Table 1. They represent an average score of library user satisfaction at Sultanah Bahiyah Library.

Table 1

Users satisfaction at PSB

Sample	Score	Sample	Score	Sample	Score	Sample	Score
1	27.01	26	23.18	50	23.75	74	27.40
2	17.78	27	27.67	51	26.42	75	20.52
3	31.71	28	28.00	52	22.72	76	17.28
4	33.81	29	29.21	53	25.22	77	28.19
5	33.93	30	27.67	54	20.00	78	27.41
6	29.05	31	28.00	55	24.18	79	20.87
7	22.86	32	14.89	56	25.74	80	35.00
8	28.72	33	29.63	57	27.49	74	27.40
9	33.66	34	31.13	58	24.27	81	24.32
10	33.45	35	23.30	59	21.70	82	30.56
11	29.04	36	34.09	60	23.99	83	29.03
12	33.51	37	28.77	61	24.68	84	34.05
13	26.36	38	33.00	62	24.36	85	29.53
14	25.44	39	27.51	63	28.20	86	30.56
15	28.76	40	25.26	64	20.80	87	28.00
16	32.72	41	26.46	65	24.89	88	27.23
17	32.24	42	26.21	66	22.10	89	32.53
18	34.57	43	26.00	67	21.34	90	26.98
19	34.88	44	29.50	68	24.16	91	35.00
20	31.81	45	34.80	69	23.02	92	27.05
21	25.19	46	33.80	70	19.74	94	32.79
22	28.00	47	29.63	71	29.48	95	33.08
23	29.72	48	30.47	72	26.01	96	34.04
24	29.49	49	19.83	73	31.69	97	27.67
25	27.87						
X-Bar-bar = 3.95		R-Bar = 0.97		SD = 0.77			

Upper control limit (UCL) = $\bar{\bar{x}} + A_2\bar{R}$
Lower control limit (LCL) = $\bar{\bar{x}} - A_2\bar{R}$
Upper control limit (UCL_R) = $D_4\bar{R}$
Lower control limit (LCL_R) = $D_3\bar{R}$

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

The mean of sample 1 is

$$x_1 = \frac{Total\ values}{n}$$

$$= \frac{[27.01]}{7}$$

$$= 3.85$$

Then, proceed to the step of calculation for average mean, denoted as $\bar{\bar{x}}$ (for double bar) which is the average of all sample means.

Average mean, $\bar{\bar{x}} = \frac{Total\ Average\ mean}{97\ person}$

$= \frac{2{,}687.93}{97}$

$= 27.71$

Table 2
Tabular values for X-bar and range charts

Subgroup Size	A_2	d_2	D_3	D_4
2	1.880	1.128	-----	3.268
3	1.023	1.693	-----	2.574
4	0.729	2.059	-----	2.282
5	0.577	2.326	-----	2.114
6	0.483	2.534	-----	2.004
7	0.419	2.704	0.076	1.924
8	0.373	2.847	0.136	1.864
9	0.337	2.970	0.184	1.816
10	0.308	3.078	0.223	1.777
11	0.285	3.173	0.256	1.744
12	0.266	3.258	0.283	1.717
13	0.249	3.336	0.307	1.693
14	0.235	3.407	0.328	1.672
15	0.223	3.472	0.347	1.653
16	0.212	3.532	0.363	1.637

Tabular chart (x-bar chart) which also known as median chart used to calculate based on value and on subgroup size. Tabular chart were fix data. The larger the sample size, the better its sensitivity of chart to detect nonrandom. X chart and R-bar were calculate based on it.

- **X - Chart**

n = 97 , A2 = 0.419

UCL = X-Bar + A2 R-Bar
= 3.95 + (0.419)(0.97)
= 3.95 + 0.41
= 4.36

LCL = X-Bar - A2 R-Bar
= 3.95 - (0.419)(0.97)
= 3.95 – 0.41
= 3.54

- **R-bar**

From the table D4 = 1.924, D3 =0.076

UCL = D4 x R-Bar
= 1.924 x 0.97
= 1.866

UCL = D3 x R-Bar
= 0.076 x 0.97
= 0.074

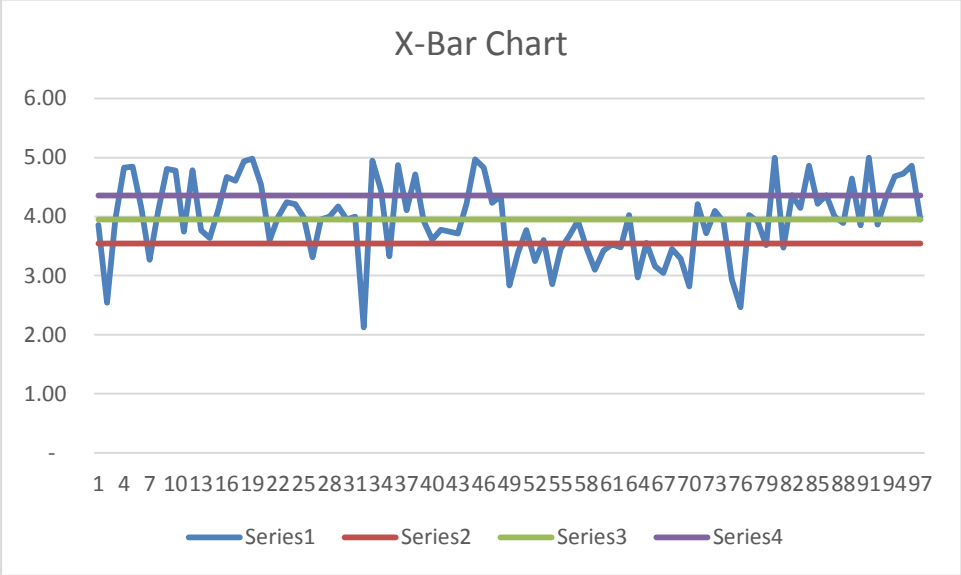

Figure 2
X-Bar chart

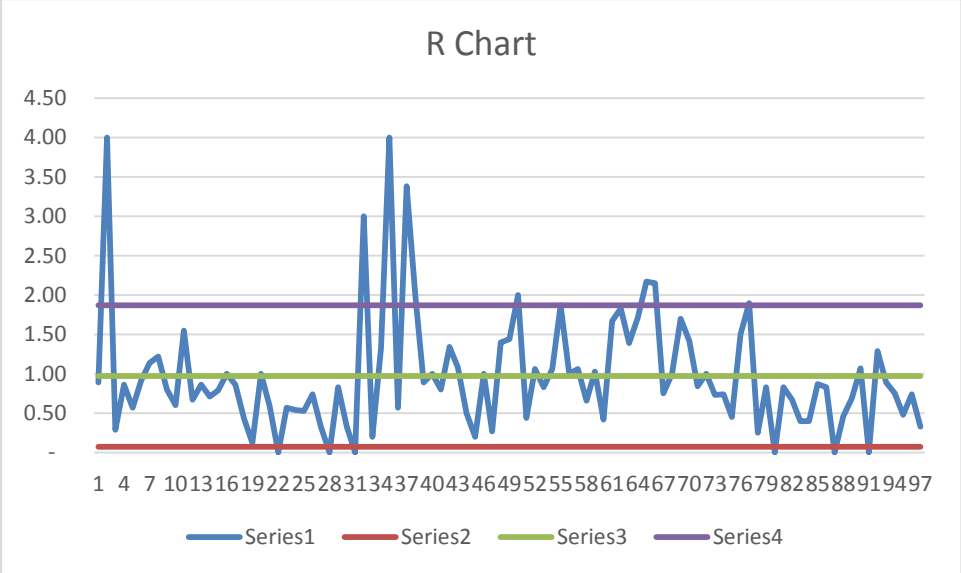

Figure 3
R chart

After defining process capability, to determine whether a process is capable or not were calculate. Calculating process capability given the specification limits based on calculation before.

USL = 4.36

LSL = 3.54

Capability index (C_p)

The capability index C_p, is the ratio of tolerance (USL-LSL) and 6σ.

$$C_p = \frac{|USL - LSL|}{6s}$$

= (4.36 - 3.54)/ (6 x 0.77)
= (0.82) / (4.65)
= 0.18

Process capability index (C_{pk})

Process capability index (*Cpk)* shown the centering of the process. It can be calculated using the following formula:

$$Cpk = \min\left\{ \frac{USL - \bar{x}}{3\sigma} , \frac{\bar{x} - LSL}{3\sigma} \right\}$$

= (4.36 – 3.95)/ (3 x 0.77)
= (0.41) / (2.31)
= 0.18

CONCLUSION

Level of PSB service does not capable based on process capability analysis measurement because of Cp is 0.18 < 1 which mean process variation is too much. Cp of analysis data tell that six-sigma process spread is greater than the tolerance which means that it is not a good services and usually better services performance want cpk of 1.3 or above. UCL and LCL of graph show that the process are not capable and weren't in good proportion. Services capability of PSB not consistent because of the flow of graph which also incapable with customer satisfaction. PSB should improve more of their services to make their users more satisfied and their process more capable in the future. Library that provided better and excellent in their service is a good organization management service. The aim of application of process capability services is to know whether services provided by library meet customer satisfactions or user of library services to library resources and to know the services they now. By applying process capability, the amount for the services provided are inconsistent and not constant over time. A good or excellent process is when a process in the center of the graph including constant. Therefore, authority should focus in improving and monitoring their performance towards better and excellent services. As a recommendation, they should apply process capability services through their customer feedbacks to analyze the performance and the same time to sustain them.

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