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Applications of business intelligence, acceptance sampling plan and prediction analysis based on smart watch

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Abstract
Data Analytics, Business intelligence and quality inspection are emerging areas in statistics. These areas are independent for their performance and have unique structures. In this study, to try an object base analyses using data analytics, business intelligence and quality Inspection. Also the present work to predict the sales for next two years and discussed differences between sampling and data mining.

Keywords: Business intelligence, predicting analysis, data mining, data analysis, acceptance sampling plans

Introduction

Smart watch is a technology tool connects with/ without support of mobile phones widely many brands launching smart watches. Main advantages of smart watch is a health monitoring tool, faster access to social network reduce need to take out phone less likely to miss call and notifications camera features able to synchronize data with smart phones. Several research studies ongoing in society/industries based on statistics like, biomedical, manufacturing industries, social Medias, artificial intelligence, business intelligence, agriculture, and so on. In this present study based on different fields of statistical concepts involves in single object [Smart watch]. Its divide into two sections, section one shows the quality inspection, based on acceptance sampling plans its helps to the producer to produce error free products also it helps to the consumer to get good quality products. Section two shows the business intelligence it's based on statistical data analysis its helps the producer to know the performance of their business status also it helps to the consumer to know about the product performance, effect of specification, existing customer reviews of the product and so on. Porzi, L *et al.* (2013) [2] have discussed smart watch based gesturer cognition system for assisting people with visual impairments.
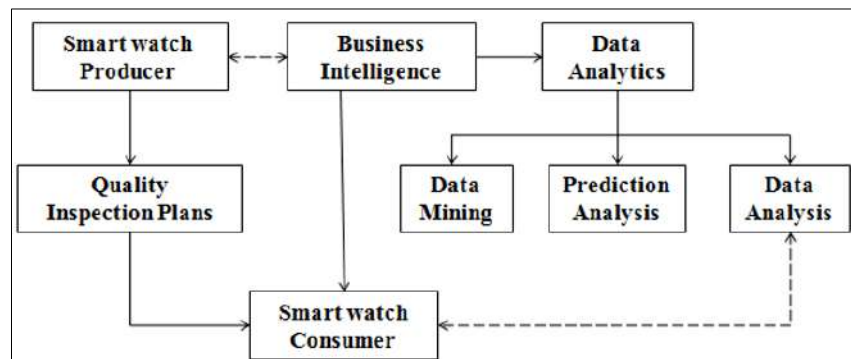

Fig 1: exposes the performance of the present research work

Quality inspection

Quality inspection is the major area of Statistical Quality Control; it shows the performance of the population with the help of sample. Also inspecting the samples using some acceptance sampling plans and evaluate the product whether it is fit to use or not. There are more number of sampling plans active in production industries, for inspecting the samples and analysing performance of the population.

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Each plan has some unique structure and methodology, some plans reduce the producer risk, some plans reduce the consumer risk some time favour for both. In this study, the quality inspection based on acceptance sampling using Double Inspection Sampling Plan. Senthilkumar and Sabarish (2020) [4] have developed the Construction and Selection of Double Inspection Single Sampling Plan [DISSP (0, 1)]. Senthilkumar and Sabarish (2021) [5] have developed Selection and Development of Double Inspection Single Sampling Plan. Senthilkumar and Sabarish (2021) [5] have developed Economic Design of Double Inspection Single Sampling Plan. Senthilkumar and Sabarish (2022) [6] have developed Design of Double Inspection Quick Switching System [DIQSS (0, 1)].

Senthilkumar and Sabarish (2022) [6] have developed Construction and Selection of Double Inspection Single Sampling Plan for an Independent Process using Bivariate Poisson Distribution.

Operating procedure
1. Select a random sample of size 'n' units from the lot and test each unit for conformance to the specified attribute requirements.
2. Count the No. of defectives in the first inspection 'd_1' then move to next step.
3. If $d_1 \leq c_1$ Pass the same sample for the second inspection for the same sample of size 'n' otherwise ($d_1 > c_1$) reject the lot.
4. Count the No. of defectives in second inspection for the same sample, d_2 then move to next step.
5. If $d_2 \leq c_2$ accept the lot otherwise ($d_2 > c_2$) reject the lot

Fig 2: Performance of Quality Inspection

Illustration and importance for double inspection sampling plan
In Double Inspection Sampling Plan two inspectors checking two different quality characteristics of smart watch, c_1= checking quality of the display and c_2 = checking the performance of the pulse monitor, both the quality characteristics are independent. Figure 1 shows the performance of Double Inspection Sampling Plan. In this plan

we inspect two different and important quality characteristics of the similar product, to showcase the quality of the product. This proposed method was pertinent for Mass and Costliest product Production and also it decrease the consumer risk.

Business intelligence
In a recent day's start-ups and business entrepreneurs are increase also market have a lot of competitors doing same business in that situation industries handle lot techniques and marketing strategies to enclose their customers. In that situation they need some statistical analysis and business intelligence support. Business intelligence refers to the procedural and technical infrastructure that collects, stores, and analyses the data produced by a company's activities also is a broad term that encompasses data mining, process analysis, performance benchmarking, and descriptive analytics. BI parses all the data generated by a business and presents easy-to-digest reports, performance measures, and trends that inform management decisions. Business Intelligence helps the producer to know the performance of their business status like production, sales, demand, customer preferences, problem solving, new innovations, improving their quality. In that situation industry surely maintain the data sets of production, sales, imports, exports, debtors, creditors and so on. In future performance used these kinds of data. Here the prediction analysis using to producer to know the future sales and taking decision about the production it increase or decrease for next years, L. Yu, L. Zhou, *et al.* (2014) [1], " Application of a new hybrid model with seasonal autoregressive integrated moving average (ARIMA) and nonlinear auto-regressive neural network (NARNN) in forecasting incidence cases of HFMD.

Table 1: The values of monthly report of sales in three years

Month	Year wise Sales in lacks				
	2018	2019	2020	2021	2022
Apr	15	33	43	76	87
May	18	34	48	78	93
Jun	23	38	48	79	95
Jul	21	28	52	81	99
Aug	26	38	55	83	101
Sep	32	38	60	84	103
Oct	28	33	58	86	107
Nov	34	43	62	88	107
Dec	31	41	67	89	109
Jan	28	41	65	91	111
Feb	26	44	69	93	112
Mar	37	46	80	94	114

Table 1 shows the values of monthly report of sales in three years also it's called as actual data. Using linear regression equation and predicting future years to the purpose of production. We have generated predicted sales for the next two years (2020 & 2021). This Predict is based on the past time series data that were used in the identification of the ARIMA model. The time series data has been used to generate the graph and the predict is shown in the figure. Based on these analysis sales will be gradually increases so the producer concluded to increase the production for next years. Figure 3 shows the actual and predicted values for smart watch sales.
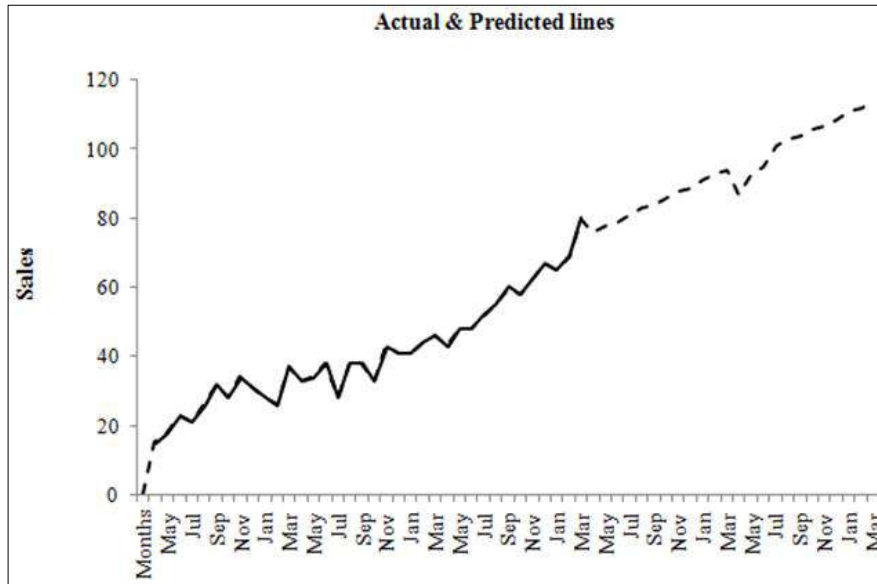
Fig 3: Graph of smart watch sales

Data analysis

Data analysis is a process of inspecting, cleansing, trans-forming, and modelling data with the goal of discovering useful information, informing conclusions, and supporting decision-making. In this study deals with sleeping analysis of the person in one night using basic descriptive analysis to analysis the data. Data's collected from the smart watch Realme band 2.

Table 2: Sleeping monitor of a smart watch user in during the sleep time and their moments

Begin Time	End Time	Total Time	Move's	Begin Time	End Time	Total Time	Move's
10.36 pm	10.50 pm	14	Light	01.21 am	01.33 am	12	Awake
10.50 pm	11.02 pm	52	Deep	01.33 am	01.49 am	16	Awake
11.02 pm	11.18 pm	16	Light	01.49 am	02.06 am	18	Awake
11.18 pm	11.23 pm	5	Deep	02.06 am	02.40 am	34	Light
11.23 pm	11.40 pm	17	Light	02.40 am	02.50 am	10	Deep
11.40 pm	12.27 am	47	Deep	02.50 am	03.00 am	10	Light
12.27 am	12.30 am	3	Light	03.00 am	03.34 am	34	Deep
12.30 am	12.44 am	14	Awake	03.34 am	03.56 am	22	Light
12.44 am	01.05 am	21	Light	03.56 am	05.58 am	122	Deep
01.05 am	01.18 am	13	Awake	05.58 am	05.59 am	1	Awake
01.18 am	01.21 am	3	Light				

Table2 shows sleeping monitor of a smart watch user in during the sleep time and their moments. The moments are noted by three categories [Light, Deep and Awake]. Table 3 shows the basic descriptive analysis to simplify the table data's also it's converted the minutes data into hours. Figure 4 show the sleeping levels of an person in single night based on table and table data's It shows the person have deep sleep maximum 270 minutes [4.5 hrs], Light sleep at 140 minutes [2.33 hrs] and awake at during the sleep using pie diagram.

Table 3: The basic descriptive analysis to simplify the table data's also it's converted the minute's data into hours

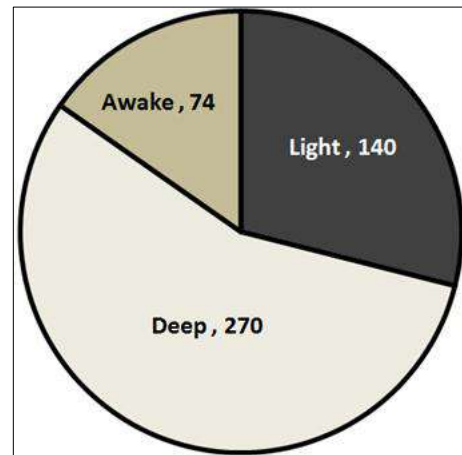| Category	Minutes	Hours
Light	140	2.333333
Deep	270	4.5
Awake	74	1.233333
Total	484	8.066667

Fig 4: The sleeping levels of an person in single night

Conclusion

In this study, Acceptance sampling plan involves inspecting the product after production it fit for use/not. Generally acceptance sampling helps the producer to produce error free products and reduce the time similarly its helps to the consumer to get good quality products. Business Intelligence helps the producer know about the sales and performance of the product. Similarly its helps the consumer to know about the product performance from the existing customers reviews also prediction analysis using ARIMA model for sales data. Also in this study discussed the difference between sampling and data mining. This all analysis and works done before customer buying a smart watch also the study covers sleeping analysis using data analysis for after buying smart watch.

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