

ESSENTIALS OF INFORMATION TECHNOLOGY IN RETAILING SECTOR: USUAGE OF IT TOOLS AND TECHNIQUES

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Abstract: Retail Sector is one of the fastest growing sectors in the world. The need of the people is increasing day by day. Business owners are looking at various options to attract the customers to buy different products. Information technology is an important aspect to be considered for the success of the retail industry. Tools and Techniques to aid the business growth is vital. Different kinds of solutions are available for different retail needs. The usage of RFID tags for shops and the integrated software is an aspect to be factored for shops. Website and portals to cater to the need of online shopping is another aspect. In this paper the practical usage of information technology is discussed and few models to predict error thereby increasing process efficiencies are also highlighted.

Keywords: RFID, Information technology, websites, portals

1. Introduction to Information Technology

Information Technology is the application of computers to store, retrieve, transmit and manipulate data. It is important to understand the business context of the organization before implementing information technology. Information technology includes hardware, software, internet, engineering and e-commerce. The advancement of information technology is highly

significant in the last few decades. The speed at which data can be stored and retrieved is vital. Business decisions depend on the data analysis and reports generated from the various information technology systems. Data storage as a process and different technology databases that ensure data integrity is the key in information technology. Extensible markup language (XML) is a popular representation for data representation and data transmission. Data analytics and business analytics are actively explored in leading organizations to analyze the customer data. Data drives performance and the ease of availability of data to take right business decisions are important. The business value of information technology lies in the automation of business processes and the productivity tools to increase efficiency.

2. Information Technology Tools and Techniques

Application of information technology in retail industry is important for the success of the sector. In the current market scenario there is significant competition in the retail industry. Online shopping has grown significantly in the last few years. The ability for the business owner to be agile and stand up to the expectations of the customer is a challenge. The usage of web based solutions is vital. The need to set up an online portal that can withstand the user load is critical. The portals should be technology independent. The technology advancements should not force the business owner to update the portal regularly thereby impacting the online business. Platform neutral application development with state of the art open technologies is mandatory. Easy to use applications and browser based user interfaces with high user experiences will increase the consumer usage. The availability of the applications and its performance will determine the success. The ability to integrate with other vendors and plug in components will also enable the scalability of the business.

The importance of in person shopping is also growing. Customer needs are changing and the ability to match their requirement is an ongoing challenge. The business owner needs to ensure that all the products have RFID tagged to their products. Integrated software that can pull business reports based on RFID data will enable to take business decisions faster. Effective usage of RFID data is important. The ability to read the RFID tags without errors is also equally important. Using simple RFID reader and integrating it with application software will enable the business manager for effective sales projection. Inventory management is also dependent on the software. The financial module is also part of the integrated software. Data errors will be misleading and not help in taking the right business decisions. The importance of RFID IT infrastructure integration to supply chain process is critical. The usage of quantitative management methods to analyze the

business data is explained. Information technology tools like prediction models and multiple regression techniques can be used to analyze RFID error rates. An example of one of the techniques is detailed in the case study.

3. Prediction model technique to detect RFID errors

An error is a failure to interpret a returned signal from a transponder tag. By measuring the errors against the total reads, any problem in RFID scanning can be identified. For the convenience of the billing operator, the products are marked at a particular place where the RFID tags should be implanted. The billing operators are trained to look for the RFID at these places. Read errors are associated with the number of times that an antenna must probe the incoming container to properly detect the tag. A read error can be generated because of various reasons like faulty tag, antenna or improper placement of antenna or improper tag types on the container material or poor signal interference or low signal strength.

1. Y – Error Rate – It is the number of read errors over the time interval (1 hr) divided by the number of reads (the number of successful reads plus the number of read errors) in this time period. In effect this is the percentage of errors in a given time period.
2. X1 – Displacement error – The difference between the distance of RFID tag expected to be implanted versus the actual place where it is implanted.
3. X2 – Signal Interference – RFID frequencies range is mapped to a scale of 1 to 5, 1 being the lowest and 5 the highest.

Also, by studying the co-efficient of correlation and co-efficient of determination, it can be ascertained that no other influencing factor need to be added to the model to explain the error rate, which is the Y.

4. Data Analysis and regression equation

The data collated for the x and y factors are as shown in the Table 4.1. Data points from 25 instances in an experiment were collected and considered for analysis.

Y	X1	X2
Error Rate (Ratio)	Displacement Error (inches)	Signal Inference (scale1-5)
0.101	0.300	5.000
0.085	0.010	5.000
0.092	0.020	4.000
0.245	0.500	3.000
0.210	0.500	3.000
0.150	0.020	1.000
0.130	0.030	1.000
0.150	0.020	1.000
0.140	0.020	3.000
0.150	0.000	1.000
0.100	0.000	1.000
0.100	0.000	1.000
0.080	0.030	5.000
0.090	0.030	3.000
0.070	0.020	3.000
0.100	0.400	3.000
0.125	0.300	3.000
0.135	0.350	3.000
0.141	0.045	3.000
0.350	0.400	1.000
0.400	0.500	1.000
0.700	0.600	1.000
0.100	0.200	1.000
0.050	0.200	3.000
0.900	0.900	1.000

Table 4.1 – RFID Data

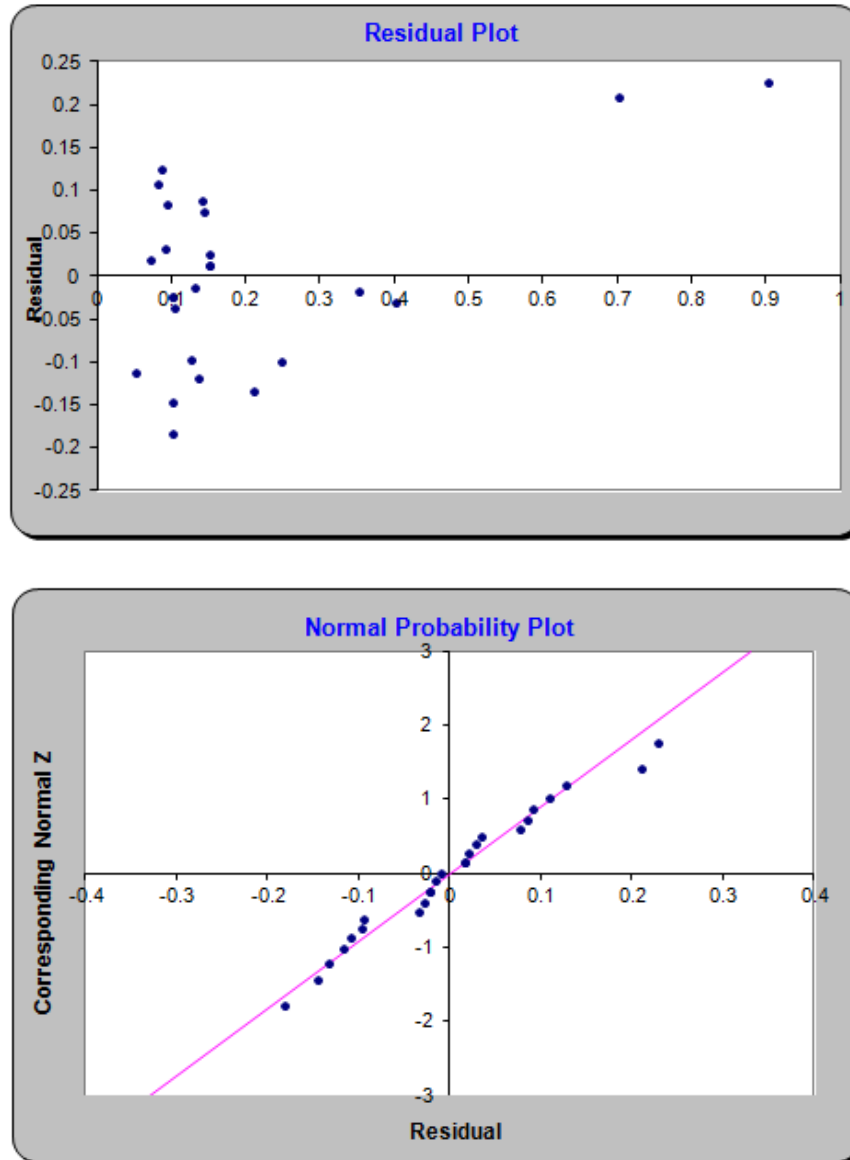


Figure 4.1 – Residual Plot

Mirror pattern is not found in Figure 4.1, Residual Plot and hence no hetero-scedasticity is found. The normal probability plot is approximately linear. This would indicate that the normality assumption for the errors has not been violated.

The p value for displacement error, is 0.0001 which is < 0.05 and p value for signal interference is 0.015 which is also < 0.05 , null hypothesis is not valid, which means the variables selected have an impact to error rate.

Intercept	Displacement Error (in inches)	Signal Interference
0.16607	0.61806	-0.0426

Table 4.2 – Regression Equation

As shown in Table 4.2, displacement error has a positive influence on error rate. As the displacement error increases the error rate is increased. The influence of signal interference is negative. This means that when the value of displacement error is low and signal interference is high the error rate will be low.

5. Determining the sub process and selecting the parameters

Based on project data analyzed it is evident that error rate is critically influenced by RFID tagging sub process and displacement error of the technicians involved in the tagging process. For tagging sub process the number of steps involved in the tagging is detailed. The number of rounds of tagging and checking can also be considered as the parameter. For example, one round of tagging alone, one of round of tagging plus sample checking and finally one of round of tagging and checking all the products can be considered. There should be standard baseline values that will include lower specification limit (LSL), goal and upper specification limit (USL). The same can be gathered for error rate as well. Based on the sub process selected, the goal for signal interference and displacement error would be calculated. It is also important for the project team to justify why they have gone with a particular sub process and the rationale. Table 5.1 gives the sub process performance baseline for signal inference and technical experience. The values are represented by A1, A2, A3 and so on. Based on the current project context, the parameters and rounds of testing chosen are shown in Table 5.2, Selected Sub process performance baseline. Based on the actual data collated, compare the expected and actual error rates captured. Based on the actual value in each phases, the predicted value for next phases are accordingly impacted. The data is compared against the goal and continuous improvement measures to reduce error rate is focused on.

Sub process	Metric	Parameter	LSL	Goal	USL
Signal Interference Testing	SIT	Test steps (< 4)	A1	A2	A3
Signal Interference Testing	SIT	Test steps (>4)	C1	C2	C3
Displacement error during tagging	DET	1 round of tagging	D1	D2	D3
Displacement error during tagging	DET	1 round of tagging and sample checking	E1	E2	E3
Displacement error during tagging	DET	1 round of tagging and all checking	F1	F2	F3

Table 5.1 - Sub process performance baseline

Sub process	Metric	Parameter	Goal	Comments
Signal Interference Testing	SIT	Test steps (>4)	C2	
Displacement error during tagging	DET	1 round of tagging and sample checking	F2	

Table 5.2 – Selected Sub process performance baseline

6. Conclusion

Information technology drives the success or failure of an organization. Retail industry is going through high competition. For a business entity to succeed, identifying the right requirement and mapping a right information technology solution is important. Also the business institution should ensure that it should not lead to heavy maintenance of software. The relevant information technology tools and techniques should be applied based on the business context. The increase of point of sale and point of supply has led to the increase in information technology spend significantly. Market knowledge is important and it is getting more complex day by day. The customer supporting systems and operation support systems should be well integrated. Enterprise resource planning systems help the institutions with an integrated business view. Data analytics

help in taking the right business decisions at the right time. In the paper the importance of information technology and different tools are highlighted. An example of using prediction models to predict RFID errors was also detailed out.

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