Dynamic Prices in Retail and Its Impacts on Logistics

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Keywords: Gamification, Retail, Inventory, Logistics, Dynamic Price.

Abstract: Various factors have contributed to the immense growth of dynamic pricing: demand data, technology, and decision support tools. A sample survey was conducted to get the perspectives of small business owners in retail and consumers to understand their perspective on dynamic consumer pricing and its effects on logistics. The survey questions were structured in a way to provide perspectives on consumer experience and buying behaviour concerning dynamic pricing and gamification. The study realized retail companies are not well prepared for the logistical changes due to dynamic pricing. Traditionally, retail stores have focused on ensuring that the supply chain is responsive to client demands. For instance, leftover inventory was seen as a problem arising from poor decisions on dynamic pricing. After a promotional selling season, many of the retail respondents indicated that they face problems of when and how much to mark down leftover inventory.

1 INRODUCTION

The research paper will be focused on dynamic prices in retail and its impacts on logistics. Also, gamification will be studied as a part of dynamic pricing. The study is based on the perspective of consumers and retailers about the dynamic pricing and the logistics issues, especially for the retailers. To better understand the situation, two surveys were conducted, and the findings were discussed in the study. The discussion facilitates managerial and theoretical insights on the study in a business context. The existence of different pricing strategies and, modern technologies and tools have subjected companies to change their logistic operations to remain competitive and optimize the profits.

2 LITERATURE REVIEW

2.1 Big Data

Various factors have contributed to the immense growth of dynamic pricing: demand data, technology, and decision support tools (Chen et al., 2020; Chen, 2016). Big data analytics is proving to be the gold in the 21st century- allowing companies to easily track customer purchase metrics and other indicators that could drive sales. Indeed, determining the appropriate price to charge a customer for a product is often a complex task – requiring the company to have knowledge of its operating costs and supply as well as current consumer valuation of the product and changes in future demand (Cope, 2007; de Boer 2015). Charging the customer, the right price, therefore, requires that a store has a wealth of information about consumer habits and be able to set and adjust prices at minimal costs.

2.2 Price

Prices are also formed based on costs. And, research studies provide that up to 50-70% of all costs in every product consists of logistic costs (Abbasi, 2011). Equally, Abbasi (2011) finds that warehousing, deterioration, loss, insurance, package, and administration make stocks comparatively expensive. Abbasi (2011) indicates that inventories can absorb up to 30% of logistics costs and represent a significant proportion of the total assets of an organization

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Guvenc, O., Kazybayeva, A. and Abeshev, K.
Dynamic Prices in Retail and Its Impacts on Logistics.
DOI: 10.5220/0009838706590666
In *Proceedings of the 6th International Conference on Vehicle Technology and Intelligent Transport Systems (VEHITS 2020)*, pages 659-666
ISBN: 978-989-758-419-0

Inventory carrying costs can be considerably high – amounting to one-fifth of the total costs. Abbasi (2011) likens dynamic pricing to contingencies – from which there is a need to hedge the supply chain. For retailers, there is a need to keep additional inventory for various situations such as unexpected price changes, which often comes as a result of dynamic pricing and gamification. Effective management of inventory reduces carrying costs and increases customer satisfaction.

2.3 Gamification

Gamification refers to the application of elements of game playing to other areas of activity, such as marketing, pricing, and the enhancement of other non-game contexts (Huotari & Hamari, 2017). The method of gamification is less important than the presence of gamification (Rodrigues, Oliveira, & Rodrigues, 2019). Indeed, the method of gamification matters only within the context of the amount of interest and engagement maintained by consumers and the identification of how those gamification methods can be changed in order to increase overall interest and participation, and whether that interest and participation leads to the purchase of goods or services from the goods or services provider using gamification methods (Rodrigues, Oliveira, & Rodrigues, 2019).

Koivisto and Hamari (2019) have noted an increased shift within today's society toward making reality "increasingly game-like" (p. 191). Researchers have noted that the use of gamification serves as a motivator, fulfilling the psychological need satisfaction of participants, causing individuals to continue to utilise programs and services that integrate gamification in an effort to continue to achieve feelings of satisfaction (Sailer, Hense, Mayr, & Mandl, 2017).

Given the use of gamification in applications (apps) accessible via computer, smart phone and tablet, and the pre-existing integration of dynamic pricing strategies by online retailers such as Amazon, the argument can be made that the potential integration of gamification in dynamic pricing is not a large leap, as the technology necessary to integrate the two components already exists (Chen, Mislove, & Wilson, 2016; Kessels, Kraan, Karg, Maggiore, & Valkering et al., 2016). The researchers believe that the integration of an app could be used to allow customers to track changes in pricing, with the prices of different items moving based on the demand for those items.

2.4 Supply Chain Management

Abrate and Viglia (2016) also believe that advancement in information and technology has provided remarkable opportunities for both marketing and supply chain management. In the marketing domains, stores have increased the ability to understand individual consumer preferences and to adjust prices – improving the ability to optimize revenues dynamically. However, not much research has been done on the influence of dynamic pricing and gamification on the supply chain and logistics. Abrate, Fraquelli, and Viglia (2012) suggest that firms can use technology to improve their visibility costs and lead times – internally throughout the supply chain continuum.

The authors believe that the next major development for competitive advantage is for firms to link innovations in marketing with those in the supply chain management – allowing them to refine pricing, capacity, production, and inventory decisions. Such smooth coordination could offer managers visibility to true costs and responsiveness as they make pricing and promotion decision – and equally provide supply chain managers a perfect understanding of pricing structures when they decide to expand capacity and strategic location of inventories (Elmaghraby & Keskinocak, 2003; Faraquiy, 2012). The results will be an optimized revue structure and optimized profits across the entire supply chain.

2.5 Targeting Audience

Other recent studies have further expressed concerns about the failure to link logistics with dynamic pricing (Liu, Guan, & Wang, 2019; Pupavac, 2016; Sen, 2013). Various industry experts have concluded that opportunities exist for linking the supply chain to dynamic pricing and gamification; an opportunity that will increase the ability of stores to serve their customers in a highly targeted manner – the key to profit optimization (Zhou, Li, & Tang, 2009; Zhang & Weatherford, 2017). Digital technology has provided the capability of sharing information promptly – however, organization cultures have been relaxed in keeping with the pace of technology. For instance, in several instances, retails stores have run out of inventory during offers. For instance, the Black Friday is a perfect example where retail stores provide insane offers to their customers; however, several have missed on their items even after making purchases (Levin, McGill, & Nediak, 2010). This is an inconsistency in the supply chain system and logistics – which fails to augment dynamic pricing

and gamification. It is also not unlikely to miss Ubers during promotional pricing. And, the hotel and airline industries are some of the most affected – they have inconsistently matched dynamic pricing to capacity (Petruzzi & Dada, 2002; Pupavac, 2016).

3 METHODOLOGY

A sample survey was conducted to get the perspectives of small business owners in retail and consumers to understand their perspective on dynamic consumer pricing and its effects on logistics. A total of 100 people was interviewed (50 male and 50 female) to reduce bias in response. The survey questions were structured in a way to provide perspectives on consumer experience and buying behavior concerning dynamic pricing and gamification. All the respondents were emailed the survey questions. An online link was further sent to them for easy response. For retail stores, the researcher conducted manual surveys to understand how dynamic pricing and gamification affects their logistics. The survey was applied to 100 people with the 85% (Table 1) of confidence level by using the formula below:

$$n = \frac{N \cdot t^2 \cdot p \cdot q}{N \cdot \Delta^2 + t^2 \cdot p \cdot q}$$

where:
N – the amount of population in the city which is 1.002.000 (Nur-Sultan);
t – the function of confidence coefficient that can be determined according to the Table 1 and $t = 1{,}5$ with the confidence of 85%;
p and q – sampling ratios where both events have the same probability, $p = q = 0{,}5$;
Δ – maximum-permissible non sampling error and as the organizational-technical system is large, Δ is considered as 0,075.

Hence; $n = 99.9901$.

Table 1: Dependence of the t from the confidence needed.

Confidence, %	85	95	99	99,9
Function t	1,5	2	2,6	3,3

3.1 Participants

The study participants were recruited from various sources. The inclusion criteria were that a person must have purchased an item from online stores for the past three months during 'rush' hours, peaks, and other promotional periods. Income level was not an indicator of concern as the objective of the study was to understand inconsistencies in logistics due to dynamic pricing and gamification. A person was also eligible if they have used ridesharing services for the past three months. A simple deterministic analysis was conducted to analyse consumer responses. A total of 70 retail stores were considered. For a store to be included in the survey, it should have at least 30 employees, an annual turnover of $500,000, be in the consumer goods retail segment, and at least 5 departmental stores. Traditionally, understanding if revenue management type dynamic pricing works for business requires that they have a relatively fixed capacity, a predictable demand, fixed or sunk costs substantially comparable to variable costs, and have varying demands – a reason for using the criteria above.

3.2 Survey Questions

There were two surveys – one conducted to understand the perspectives of consumers about the influence of dynamic pricing models, especially the supply chain network and another to get the views of small retails stores about dynamic pricing and its effects on their profit margins and supply chain frameworks. Emphasis was given to the logistics – integration of information flow, production, packaging, inventory, transportation, and warehousing.

Hypothesis

1. All else equal, returns are positively associated with post-purchase price drops
2. Increased demand during dynamic pricing and offers constrain the supply chain network

4 RESULTS

In this section, the findings of the study are given. The questions of the survey are presented in the appendix section.

4.1 Consumers

The table below shows consumer perspectives on dynamic pricing.

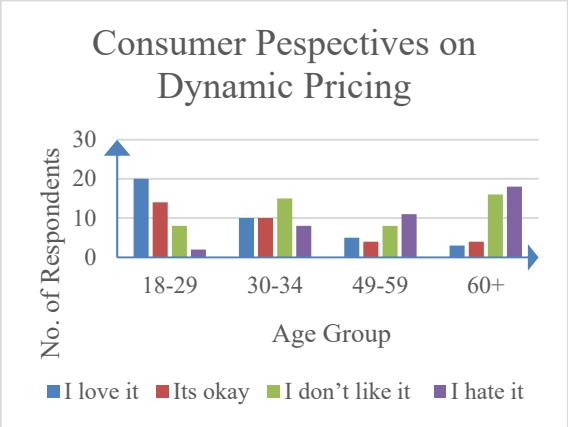

Figure 1: Consumer Perspectives on Dynamic Pricing.

As shown, millennials have the highest approvals of dynamic pricing and gamification among the various categories and groups. The highest proportion of the age segment (50) approves of dynamic pricing. Millennials are tech-savvy and confident in their ability to game various retailers on dynamic pricing practices. They are often computer knowledgeable and tend to spend substantial amounts of time scouring the internet for best prices – making them approach dynamic pricing from an informed perspective and more of sense of whether their behavior or actions of other retailers could trigger a price drop at another retailer.

Have you had a delay in the delivery of an online product you bought during promotions and peak sales?

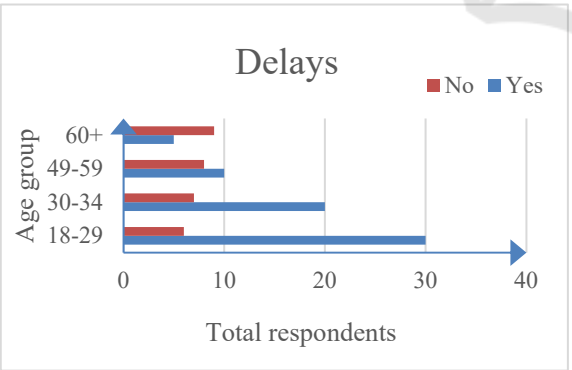

Figure 2: Delays.

What was the reason for your delay?

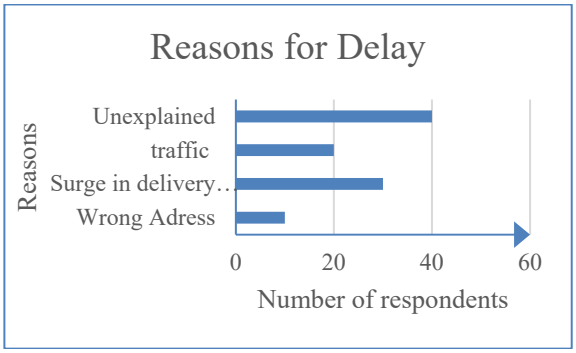

Figure 3: Reasons for delay.

What was the reason, if you did, for returning a product after purchase?

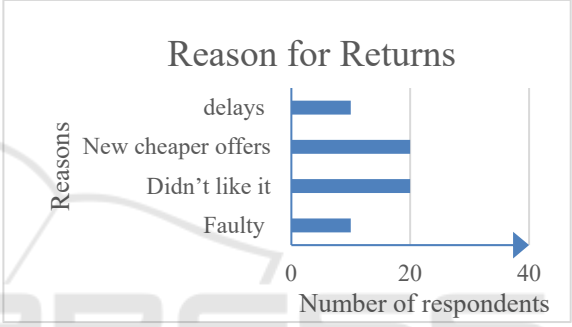

Figure 4: Reasons for returns.

Age category and number of products returned.

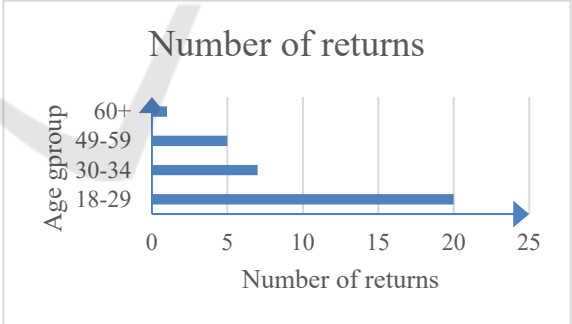

Figure 5: Number of returns.

4.2 Retailers

The graph below shows the number of 30-day returns for various retailers. The respondents indicated their average 30-day rate of returns during dynamic pricing offers, and when such offers are not available (Figure 6).

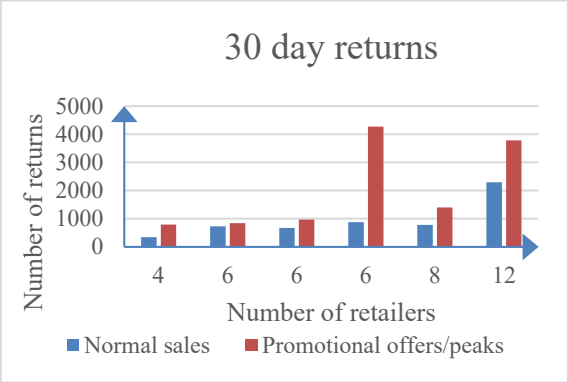

Figure 6: 30 day returns.

The data indicates that many retail outlets experience a lot of returns during dynamic ricing offers as compared to normal sales. This raises questions about the supply chain systems of such establishments and their ability to respond to increased consumer demands. More analysis of the same is provided in the discussion section.

Do you experience delivery delays with dynamic pricing offers?

From the data (Figure 7), 70% of retail stores indicated that they experience a lot of delays from their suppliers in goods delivery during promotional offers.

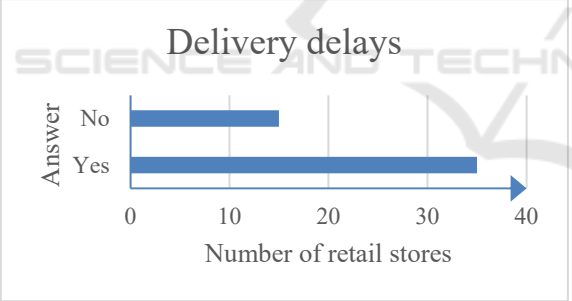

Figure 7: Delivery delays.

The increasing surge constrains the supply chain as suppliers lack the empirical estimates to understand customer volumes and needs. This indicates a need to revamp the supply model to be real-time or guided by metrics that show consumer preferences during this time. It is evident that during dynamic pricing offers, the supply chain is overwhelmed.

5 DISCUSSIONS

5.1 Leftover

The study realized retail companies are not well prepared for the logistical changes due to dynamic pricing. Traditionally, retail stores have focused on ensuring that the supply chain is responsive to client demands. For instance, leftover inventory was seen as a problem arising from poor decisions on dynamic pricing. After a promotional selling season, many of the retail respondents indicated that they face problems of when and how much to mark down leftover inventory. Some firms, however, have understood the role of smart pricing of products to ensure a seamless supply chain. Running regular promotions that increase sales to a specific customer segment increases their inventory response by concentrating on a specific domain.

5.2 Opportunistic Returns

Additionally, the analysis indicates that opportunistic returns as a result of dynamic pricing affects logistics. Opportunistic returns were mostly observed in the millennial category – they can take time monitoring product prices over the internet to opportunistically seek benefits from price changes. Secondly, as widely observed in the millennials, when retails provide for more than one payment method, customers anticipating future price drops after purchase consider payment methods with lower return costs – known as strategic choice of payment method. Opportunistic returns provide critical information on customer satisfaction and greatly influences the supply chain management for online retailers (Faruqui, & Sergici, 2010; Garcia 2010). Such returns can hurt profit margins by posing substantial costs in shipping, handling, and liquidation. Reducing such returns is an immediate concern for major retailers, especially for online stores. Banjo (2013) indicates that managing returns are highly crucial for online retailers as up to 1/3 of the online transaction are returned by customers.

5.3 Cash on Delivery

Consistent with our findings, Bandi et al. (2018) investigated to understand how returns and strategic choice of payment during dynamic pricing affect retail logistics. Some customers insist on cash on delivery (COD) as their model of payment. The COD method has been used in the traditional retail segment in other countries, including China, Russia, and India,

where significant populations lack credit cards. In emerging markets, COD accounts for up to 60% of online transactions. From the survey, customers expressed that they could decline deliveries without paying for anything. Bandi et al. (2018) found out that customers who expect a higher probability of returning products often use COD more frequently. Retailers are then affected by higher return rates, which compromises logistics. Such a segment of customers constantly feels that dynamic pricing will change their favor – or more return such items when other dynamic pricing options are offering lower rates elsewhere. COD further induces longer collection cycles, which are costly to firms.

5.4 Types of Consumer

Liu, Guan, and Wang (2019) further takes issues with strategic consumers and how they affect the supply chain, especially within the confines of dynamic pricing and gamification. The authors believe that there exist two types of consumers – a myopic consumer whose purchase decisions are based on the fact that the price tag is lower than his valuation of the product irrespective of the potential markdown on the price in the future. The other type of consumer is a strategic consumer – deciding when to buy depending on the present valuation and price, but also timing purchase decisions to maximize consumer surplus. For Aziz, Saleh, Rasmy, and ElShishiny (2011), the market is always a mixture of these two types of consumers – compelling retailers to take into account the ratio of such consumers in a market segment when implementing dynamic pricing models – delaying the purchase of product in anticipation for price reduction sacrifices present usage and current value.

5.5 Effects on Demand

For our analysis, it is evident that for buyers, especially for the strategic buyers, cost reduction informs waiting in anticipation for higher price cuts in the later period. And for sellers, dynamic pricing can delay sales, as there exists a higher profit margin in the later period. We find that, from the demand side, an increased number of strategic consumers delay the purchase, manifested through demand decrease during the first stages, and increases in the second period. On the supply chain aspect, when considering the delay, the seller can adjust the pricing strategy to remedy the trend – resulting in decreasing the profit. Myopic demand, therefore, is an issue of concern in dynamic pricing affecting supply chain and logistics. Myopic demands increase the costs of inventory as well as the proportion of dead inventory (Levin, McGill, & Nediak, 2010; Herbon & Khmelnitsky, 2017). While gamification can be used to beat myopic demands, it can fail in other industries such as brick and mortar retail stores, but work in airline bookings, ridesharing, and hotel books – enterprises that require no inventories.

5.6 Limits

Our study is limited by several factors – it is based on simple models. The sample size is satisfactory with the confidence level of 85%. But as the survey was conducted in Nur-Sultan; in the capital, it is still needed to be conducted in other representative cities and/ or regions of Kazakhstan.
Purchasing behaviors of the consumers can be different from country to country according to some other variables such as cultural issues. The costs, can vary in terms of logistics, mainly delivery and warehouse cost due to geographic situation of a country. That's why, enlarging the geography by looking in other countries can be the further steps of the study.

6 CONCLUSIONS

The analysis provides critical perspectives on the readiness of supply chain to respond to intricacies of dynamic pricing. Our evidence finds that dynamic pricing reduces the supply chain efficiency. Various retail stores are just not prepared to handle voluminous deliveries at some specific times. Equally, strategic buying is another factor that compromises the supply chain in dynamic buying behavior. Strategic buying increases the inventory costs – affecting the logistics and supply chain. To improve logistics, there is need to adopt direct to consumer models – which reduces inventory costs and returns. However, our study is limited by several factors – it is based on simple models. The sample size is satisfactory with the confidence level of 85%. But as the survey was conducted in Nur-Sultan; in the capital, it is still needed to be conducted in other representative cities and / or regions of Kazakhstan.

This paper serves as a foundation for the remainder of the research study, providing both a basis that the reader can use to understand the findings and serving as the means through which the findings of the current study will be situated within the context of the extant body of literature. At this time, enlarging the data set, recommendations for

practice, recommendations for areas of future study and the final conclusion to the study remain a work in progress.

ACKNOWLEDGEMENTS

During our research, the assistance provided by Mr Yevgeniy Shin; marketing student at Almaty Management University was greatly appreciated.

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APPENDIX

Research Questionnaire

Kindly note that the data or information collected from this survey will be used solely for academic purposes and will not be shared with any other third party, whatsoever. The research collects information on dynamic pricing and gamification.

(A). Consumers

1. Kindly, indicate your age group by ticking against an option
   1. 18-24
   2. 25-35
   3. 36-48
   4. 49+

2. Dynamic pricing is the practice of varying the price for a product or service to reflect changing market conditions, in particular the charging of a higher price at a time of greater demand. Examples include hotels and airlines charging high during peak seasons. How do you feel about it?
   1. Just okay
   2. I don't like it
   3. Neutral

3. Have you recently purchased an item online?
   1. Yes
   2. No

4. If you answered yes to question 2 above, was the item bought during peak hours, offers, and promotions
   1. Yes
   2. No

5. How often do you shop when offers are provided such as reduced prices and promotions?
   1. Often
   2. Not often
   3. I shop regularly despite offers

6. If you shopped during an offer, how long did it take for delivery?
   1. The item was delivered on time
   2. There were delays in delivery

7. How often, if any, do you experience delays for deliveries of item (s) purchased during offers?
   1. Very often
   2. Often
   3. Never experienced delay for promotional items

8. Which is your preferred payment method for items purchased online?
   1. Pay on deliveries (cash)
   2. Card and online payments
   3. Any, applicable

9. How often do you return products purchased on offers for defects, and if you do, please provide reasons?
   1. Often
   2. I don't

Part B: Retailers

Kindly note that the data or information collected from this survey will be used solely for academic purposes and will not be shared with any other third party, whatsoever. Dynamic pricing, the basis of this study, is the practice of varying the price for a product or service to reflect changing market conditions, in particular the charging of a higher price at a time of greater demand.

1. Is your capacity relatively fixed?
   1. Yes 2. No

2. Is your demand predictable at all?
   1. Yes 2. No

3. Is your inventory perishable? (For example, a seat on an airline or at a live concert)
   1. Yes 2. No

4. Are your fixed or sunk costs relatively significant compared to your variable costs?
   1. Yes 2. No

5. Does demand vary by time? (For example, is there more demand on weekends?)
   1. Yes 2. No

6. Do you experience delay in delivery during offers and promotions?
   1. Yes 2. No

7. What are some of the causes of delays you experience when you use dynamic pricing?

8. Do you feel prepared to handle extra deliveries and inquiries during with dynamic pricing?
   1. Yes
   2. No
   3. Somewhat

9. Do you experience logistical challenges, including high costs, for dynamic pricing or offers?