
Queues: An Academic Review

Theoretical perspectives on waiting at the retail checkout

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Abstract

Few aspects of retail have been studied as scientifically and with such little long-term effect as queues. Queues continue to grow in spite of intensive focus and many technical and not-so-technical solutions. Queues may be the secret to retail competitive advantage, or just an insignificant distraction as the Hungarian writer George Mikes once noted "*alone and unmonitored, the English can create an orderly queue of one*".

This literature review was prepared in response to a technologist's claim that queues could be managed with the simple measure known as "1+1". The reading covers areas such as mathematics, technology, industry and social behaviour. Several theoretical models are extracted and synthesised in order to facilitate the study of queues and discovery of retail solutions. Key concepts include the evolution of customer responses, differing customer views of the waiting experience, store-related and customer-related factors affecting customer perceptions of waiting, and the different queue-related store touch-points.

Literature shows that queues are an exceedingly complex phenomenon, and many of the drivers and indicators of customer satisfaction with queuing cannot be measured simply in terms such as the length of queue or wait time. Improving queues and satisfying customers requires considerable understanding and more sophisticated responses. The theoretical models prepared here offer a concise summary of contemporary thinking on the subject, and this may be used to inform the search for new solutions and improve queue project outcomes.

Keywords

queues, retail, customer satisfaction, literature review

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1 Literature

Literature has a valuable role to play in supporting practical work. It can inform the design of an investigation, frame and guide a search for solutions, provide templates, support vendor and product selection, and even contribute to solution design.

Literature provides a view of what others are doing, and encourages objective, open-minded thinking. Prolonged experience in a field can be seen to grant deep insight into the problem, solutions and stakeholders. However, it has to be recognised that market trends, customer expectations and solutions evolve; and the internal mechanisms in each organisation may not be suited to discovering new trends. As Alexander et al. (2009) put it; “*contemporaneous market research data reflect the wants, needs and desires of the client*”.

There is a surprising volume of academic literature discussing queues. Many of these studies are theoretical, but equally there are many that have obviously gathered data from real-world retailers. Thinking spans a wide variety of subject areas, and can be roughly categorised into mathematical, technical, social and commercial approaches. This chapter summarises each of these in the sections below.

1.1 Mathematical approaches

There is a large body of work discussing the theoretical nature of queuing, most of it mathematical and falling largely within the domain of Operations Research. Worthington (2009) provides a recent and useful summary of the last 50 years of research into queue theory, and proposes a more practical discipline called queue modelling. He notes that there are 5 dimensions important to mathematicians; number of servers (checkouts), distribution of arrivals and service times, time dependence (i.e. peak periods), number of queue lines, and extra features like queuing system rules and behaviour. Theory covers practical issues like strategic versus operational decisions, service versus cost, balking and renegeing, and the inherent uncertainty of queue modelling.

Interestingly, this paper also introduces us to an authoritative vocabulary for the behaviour we observe; balking (refusing to join a queue), reneging (abandoning the queue before being served) and jockeying (swapping queues and returning)(Rao, 1965; Pazgal and Radas, 2008).

Literature on queue simulation, such as Mandebaum and Pats (1998), points to six important key customer characteristics that should be modelled; namely the arrival pattern of customers, service pattern of customers, queue discipline, system capacity, number of service channels and number of service stages. Simulations must recognise that customers can come as individuals and groups. Simulations treat actions as either stochastic (randomly distributed) or deterministic (even, predictable or controlled), state-dependent or independent (the current condition of the system – i.e. queue length), and time-dependent or independent.

Notably absent from the literature was an evaluation of representative theory and simulations are of the real world. To be truly useful, theory and simulations should be capable of explaining what is happening and predicting what will happen. Unfortunately few of these take into account the wide variety of factors that other literature has identified, and many treat actions as simplistic and rationally guided. McElreath and Mayorga (2008) attempt to show that apparent '*confused*' behaviour is actually rational, but there is sufficient evidence (such as Kakava and Erasmus, 2012; Davis and Heineke, 1994) to show that much queue behaviour is emotive, perceptual and experiential.

In short, mathematics offers a robust foundation for capacity planning and quantitative analysis of situations and solutions. Complexity of situations and human behaviour limit real world representation, so mathematical models should not be the sole determinant of queue design.

1.2 Technical focus

Technical approaches to queuing are frequently found in technically and engineering-oriented academic journals and conferences such as those hosted by the IEEE. Technical solutions cover a diverse range of subjects, and there are adaptations of most current technology for use in queue management. Examples include advances in wi-fi tracking, shape recognition and image recognition in Wang et al. (2014).

Trade journals also mirror this technical focus, often in industry news and advertorials where a vendor is promoting a new class of technology. One example is an article in VerticalNews (2010) featuring a solution by Q-Matic.

The value of technical literature lies in providing early warning of new technical trends, a source of ideas and even pointing to problems and new ways in which these are being addressed. Novel technology tends to be researched some time before it is available to the market, so commercial literature is more likely to yield actual solutions.

1.3 Commercial focus

Commercial approaches are often presented in trade journals, where suppliers offer infomercials or editors write 'fluff'pieces to attract advertising than can contain interesting nuggets (such as Retail Interiors, 2006, and Telecommunications Weekly, 2013). Commercial approaches may also be found on supplier websites, such as www.lavi.com and www.crowdcontrolstore.com.

Literature with a commercial focus tends to be news and promotion related, such as an example in a trade journal that discussed shape recognition (VerticalNews, 2010). Consequently, care should be taken to separate sales talk from independently evaluated working solutions.

1.4 Social focus

Social approaches look at the perceptions and behaviour of customers whilst queuing. The bulk of literature falls into this category, and it is soon apparent that most of the challenges and potential solutions involve softer aspects of the queuing problem.

Literature with a social focus is broad in its coverage, and this review identified five subject areas that appeared more relevant and detailed than others.

1.4.1 Customer preference

Customer preference refers to a customer's partiality for and subsequent choice of store, checkout type and queue. As literature shows, a customer's experience with queues has a strong impact on their preference.

Kakava and Erasmus (2012) observed that queues affect customer satisfaction. Satisfaction affects preference, and the authors provide the necessary links between the levels of service that a retailer provides, the customer's perception of that service, and their future behaviour towards the retailer. Earlier work that reached the same conclusion includes Davis and Heinicke (1994). Wang et al. (2012) found that perceived waiting time, perceived task complexity and companion influence have the greatest effect on customer preference. According to their research, they see past experiences as having a greater and more complex influence over self-service technology (SST) attitudes and behaviour than SST characteristics and the individual customer's characteristics. This effect can be profound, with some customers actively minimising the time they spend in big-stores as a result of their queue experience (de Kervenoael et al., 2014).

A model of customer response to service may be derived from this literature. This is illustrated in Figure 1 below. A customer begins with expectations, they experience service first hand, form an opinion of that service, and this influences their future

preference. This is a complex dynamic that is subjective, causal and time based. It shows there are challenges to efforts to deliver customer satisfaction, but also opportunities and areas to improve (such as by influencing expectations and perceptions).

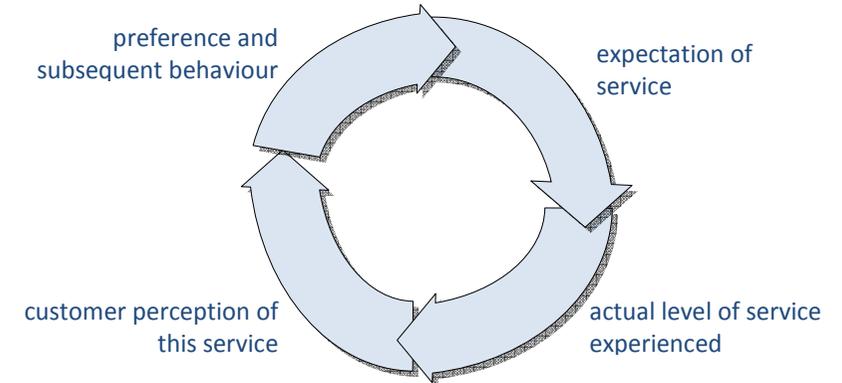


Figure 1. Evolution of customer response to service

1.4.2 Customer satisfaction

Customer satisfaction is a broad concept, and any attempt to describe it concisely inevitably leads to trite and impractical definitions. Rather than focus on what customer satisfaction is, this section will look at the highly complex, contextual, temporal and individualistic nature of the concept as it applies to queues.

Queues affect customer satisfaction! This is amply demonstrated by Davis and Heinicke (1994), Kumar (2005) and Kakava and Erasmus (2012). There are elements of a queue that have a more profound impact on customer satisfaction. Foremost appears to be the waiting. According to Kakava and Erasmus (2012), waiting is seen as inevitable by customers, and yet is regarded as a waste of time and an unpleasant, major inconvenience. Other factors that affect customer satisfaction include delays, technical problems and perceptions of store activity.

The effect of waiting is extensive. Customers who experience longer-than-expected wait times have a negative impression of the whole store, its personnel and the waiting area (Kakava and Erasmus, 2012). These authors also postulate that these customers will experience negative psychological responses such as anxiety and tension.

Queues are subjective and viewed uniquely by each customer. Literature provides several definitions for a queue:

- It is the primary cause of waiting.
- It is evidence that a wait is about to commence.
- It is the process of waiting for service.
- It is an orderly arrangement of people waiting for an action.

Waiting is also subjective, with alternative definitions available:

- Waiting commences when a customer is ready for the service encounter and ends when personal interaction with the service provider begins.
- Waiting is a multi-faceted experience, consistent with the evolution of customer response, as illustrated in Figure 2 below and synthesised from Kakava and Erasmus (2012) and Davis and Heineke (1994).

How might satisfaction be measured? Measuring customer satisfaction is difficult, something that Wilson (2002) confirmed whilst researching marketing managers in 86 UK retail organisations. The concept is too broad to precisely define and is subjective. Customers for example who have waited in the same queue will express dissimilar versions of the actual time spent queuing, and their perception of waiting time seldom matches objective waiting time measures (Kakava and Erasmus, 2012).

Waiting time		
Expected waiting time	Perceived waiting time	Actual waiting time

Figure 2. Different views of the waiting experience

Measurement may be improved by separately considering each of the dimensions of waiting time (Figure 2). Different techniques may be required to observe each stage of the waiting experience. Further, assessing the evolution of each customer's satisfaction over time could greatly assist efforts to improve satisfaction. Measuring any human emotion is also going to be especially challenging in a fast-paced retail environment. Literature suggests proxy indicators for customer satisfaction customers don't want to interact further. Kakava and Erasmus (2012) regard abandoned trolleys in the checkout area as confirmation that customers are dissatisfied with long waits.

1.4.3 Factors affecting the perception of wait times

Literature shows that a customer's satisfaction with queuing is variable and based more on perception rather than rational determination. Several broad frameworks are available to guide how we look at customer perceptions. Davis and Heinicke categorise factors that affect queue satisfaction into store-related, customer-related, and both store- and customer-related factors. These will be studied separately below.

Store-related factors

Stores themselves may affect perceptions of waiting times in many ways. Store-related factors may be grouped according to layout, merchandise and colleague interaction (Kakava and Erasmus, 2012) or by more traditional categories of colleague behaviour, product selection and visit-friendly layout (Bäckström

and Johansson, 2006). Figure 3 below illustrates, and discussion follows the diagram.

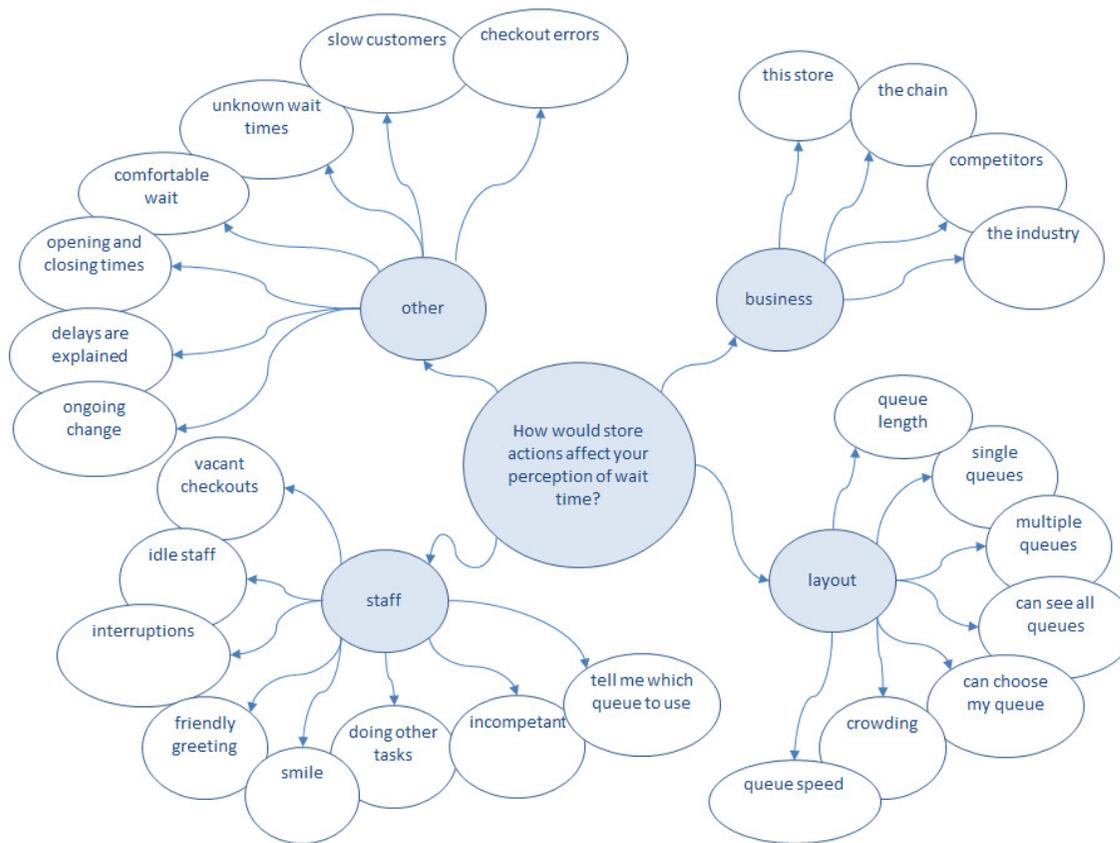


Figure 3. Store-related factors affecting perceptions of wait times

- **Behaviour of staff** (Bäckström and Johansson, 2006)

- Customers find it unacceptable when only a few of the multiple checkout points are operational at any point in time, even during peak hours. This creates the impression that the

business was designed with customers' needs in mind but that it is not managed accordingly (Kakava and Erasmus, 2012).

- Staff sometimes take too long to conclude a transaction and many even appear nonchalant, incompetent or simply do not share the same sense of urgency with every customer (Kakava and Erasmus, 2012).
- Perceptions are aggravated when staff are visibly engaged with other tasks behind the counters whilst customers are waiting in long queues (Kakava and Erasmus, 2012).
- Customers who are waiting in a queue are less tolerant when there are more vacant than operational check out points (Kakava and Erasmus, 2012). Unused capacity in the form of either idle workers or idle service stations increases customer dissatisfaction with waiting (Davis and Heinicke, 1994).
- Interruptions of face-to-face service encounters, such as by ringing telephones or interventions) gives the impression that the answered caller is receiving priority treatment (Davis and Heinicke, 1994).
- Customers who have been waiting in a queue longer than expected will experience a change of mood if the colleague at the checkout point seems competent or friendly (Kakava and Erasmus, 2012).

- **Store operations**

- Customers are likely to be disgruntled if the store does not adhere to its opening and closing times (Davis and Heineke, 1994).
- Crowding increases consumers' perceived shopping time and waiting, especially at the checkout points (Kakava and Erasmus, 2012).
- Uncomfortable waits are less tenable to customers than comfortable waits (Davis and Heineke, 1994).

- Unexplained versus explained waits (Davis and Heineke, 1994; Kakava and Erasmus, 2012).
- Repeated use of the same explanation for waiting, no matter how valid it is, will eventually negate any benefits gained from the explanation (Davis and Heineke, 1994; Kakava and Erasmus, 2012).
- Waits of unknown duration seem longer than waits of known duration, and a known wait allows customers to modify their expectations. (Davis and Heineke, 1994).
- Lu et al (2013) see perceptions being driven by queue length, confirmed by Koo and Fishback (2010).
- A satisfactory **selection of products** (Bäckström and Johansson, 2006)
- **Store and queue layout** that facilitates visit and waits (Bäckström and Johansson, 2006):
 - People waiting in a single-queue structure feel more predictability and arousal than those waiting in a multiple-queue structure (Rafaeli et al., 2002).
 - Waiting in a multiple-queue structure is does produce feelings of a lack of justice, even when no objective inequalities exist (Rafaeli et al., 2002).
 - A long, combined queue could be moving at a rather fast pace (Davis and Heinicke, 1994) but this may not be immediately apparent to customers.
 - Combined queues are less effective in practice than theory. Customers will often jockey between lines to attempt to reduce their waiting times, and this type of customer behaviour is not reflected in theoretical queuing models (Davis and Heineke, 1994).

Customer-related factors

Customer perceptions of waiting times may be affected by the customers themselves. Figure 4 below illustrates, and discussion follows the diagram.

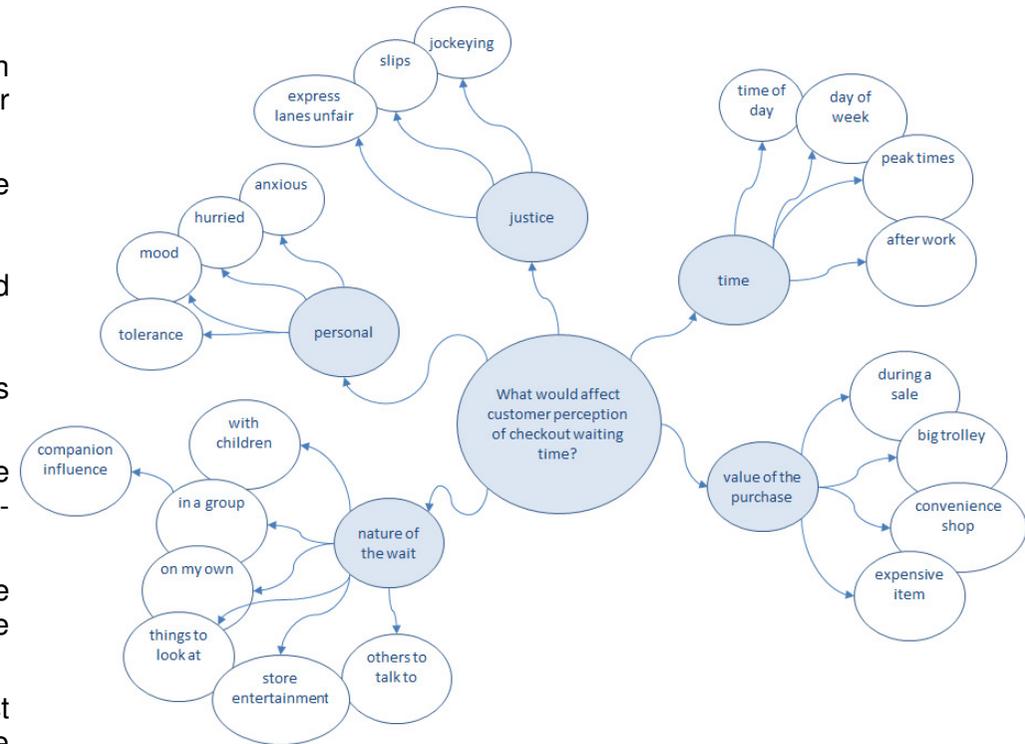


Figure 4. Customer-related factors affecting perceptions of wait times

- Perceptions are affected by **customer expectations** of performance (Davis and Heineke, 1994) and their anticipation of waiting (Kakava and Erasmus, 2012).

- McElreath and Mayorga 2008 found that the apparently confused behaviour of shoppers is actually rational, choosing convenience over patience.
- **Cause of the wait:**
 - Wait perceptions are impacted by feeling the store has negligently caused the wait (Kakava and Erasmus, 2012).
 - Customer perceptions are affected by how they view the actual performance and service encounter (Davis and Heinecke, 1994).
- **Customers' perceptions** are affected by time:
 - Queues can leave customers with the impression that their time is being wasted (Kakava and Erasmus, 2012).
 - Customers value their time, and this value is related to their standard of living (Davis and Heinecke, 1994).
 - Professional people equate wasted time with money (Kakava and Erasmus, 2012).
 - Customers who place a premium on obtaining fast service do not mind paying for it (Davis and Heinecke, 1994).
 - Time perceptions are affected by day of week, when time is less or more critical for that individual (Davis and Heinecke, 1994).
 - Customers tend to become more dissatisfied with initial waits than they do with subsequent waits (Davis and Heinecke, 1994).
 - Customers are more tolerant of extensive waits during peak hours or times such as during a sale (Kakava and Erasmus, 2012).
 - Hurried, time sensitive consumers and utility shoppers are inclined to become irritated more easily when waiting (Kakava and Erasmus, 2012).
- The **value of the purchase** can affect reaction to waiting:
 - Customers are more willing to wait when paying for expensive items than when purchasing items for everyday use such as groceries. This may be because it is easier to compare waits in frequently recurring situations (Kakava and Erasmus, 2012).
 - Customers are more willing to wait if they have obtained a bargain.
 - Customers are willing to wait longer for high value items than they would if they perceive the item to be of lower value (Davis and Heinecke, 1994).
 - Lu et al (2013) find that the more sensitive customers are to wait times the less sensitive they are to price, so longer queues lead to less revenue.
 - Koo and Fishback (2010) observed that customers waiting for a product will perceive product value as increasing as the queue length increases – specifically the more customers who are queuing behind them.
- **Nature of the wait:**
 - Customers who are unoccupied tend to perceive their wait as longer than if they are occupied during their wait. (Davis and Heinecke, 1994).
 - Anxiety regarding the nature of the service or the uncertainty as to the duration of the wait can affect satisfaction (Davis and Heinecke, 1994).
 - People standing in a queue by themselves tend to grow more impatient with the wait than people who are waiting in groups (Davis and Heinecke, 1994). This however may be contextual. Group waits may be preferred during times of anxiety, or a long wait in the presence of others in a retail store may increase distress (Kakava and Erasmus, 2012).

- Zourrig and Chebat (2009) talked about “...making interactions between customers more enjoyable may reduce waiting time perception. In contrast, if the customer-to-customer interaction is perceived as negative, this may increase the waiting time evaluation.”
- Distractions, like television programmes and music, that do not interest customers could fuel irritation and elongate customers’ psychological time frame (Kakava and Erasmus, 2012).
- A customer’s **psychological state or emotions** will affect their perceptions of wait times:
 - Attitudes and emotions of customers just prior to entering the service operation can have a significant impact on their satisfaction with the service. If the customer is very upset for example, they will probably be very dissatisfied with their wait, regardless of its length (Davis and Heineke, 1994).
 - Customers become bored when waiting, and inevitably assign some blame (Kakava and Erasmus, 2012).
 - Customers differ in their temporal orientation, or cognitive processing of the sequence and structure of events.
 - Numerous psychological, personal and situational factors could influence an individual's time perception and subsequent reactions (Kakava and Erasmus, 2012). These can include expectations, habits, motivations, mood and reaction to time pressures.
 - A customer’s personality, i.e. Type A or B behaviour, will influence their experiences and behaviour when waiting (Kakava and Erasmus, 2012).
 - Certain consumers will perceive waiting as intolerable, irrespective of the time spent waiting or reasons for the wait (Kakava and Erasmus, 2012).
 - A customer’s shopping orientation will determine his/her waiting tolerance at any point in the store, i.e. utilitarian shoppers are less tolerant of crowded queuing areas than hedonic shoppers. (Kakava and Erasmus, 2012).
- Bennet (1998a) found that irritation with longer queues reduce customer recall of checkout advertising.
- Bennett (1998b) also discovered that customer attitudes to queuing were determined by socio-economic factors and their perceptions of their economic status relative to other people.
- Perception of waiting is influenced by the concept of ‘**social injustice**’ (Larson, 1987):
 - Waiting in a multiple-queue structure has been shown to produce a sense of injustice, even when no objective inequalities exist (Rafaeli et al., 2002).
 - Combined queues are perceived as being fairer but taking longer (Davis and Heineke, 1994).
 - Waits may be seen as fair or unfair (Davis and Heineke, 1994).
 - Slips occur when a customer enters a queue later is served before others already there (Davis and Heineke, 1994).
 - Skips occur when a customer is skipped over for service (Davis and Heineke, 1994; Larson, 1987).
 - Jockeying or moving from one queue to another is seen as unfair (Davis and Heineke, 1994).
 - While some customers may appreciate express lanes during peak hours when they have limited transactions to conclude, customers who remain waiting in long queues may perceive the quick progress of express lanes as unfair (Kakava and Erasmus, 2012).

Factors not discussed in literature

The literature that was reviewed did not reveal discussion of some factors that business has found to be relevant:

- Customer preference for specific checkout types.
- The effect of age on checkout preference.
- Factors like basket size and disabilities that prescribe the checkout choice.
- Sight-lines and the ability of the customer to view other queue lengths.
- The impact of merchandising and impulse.
- The impact of mobile phones and other devices.
- The effectiveness of signage.
- Store efforts to control queue length by moving customers from one queue to another.
- The effect of monitoring on staff and customers.

1.4.4 Interaction

Store queues are interactive environments. Customers engage with the store, its products and people throughout their shopping journey, and these experiences can affect their queue perceptions.

Alexander et al.'s historical analysis of the UK supermarket shows that customers adapt to their environment and even operate as co-creators of innovation. Their study offers a useful framework of interactions that customers may experience (Figure 6), a framework of touch-points that may be used in improvement efforts. These are however limited to tangible entities. Customer experience and their perceptions are as important as physical touch, so the framework has been extended with intangible dimensions that can affect customers at any relevant point on their journey. These highlight the temporal and ephemeral nature of interactions, and suggest that

the messages that customers receive may be as effective as physical barriers.



Figure 5. Customer touch-points

2 Studying queues

Academic literature has revealed a many factors affect a customer's perception of waiting and queues. Customers individually define the queue (section 1.4.2) and perceive their wait (section 1.4.3). Retail organisations therefore need to continually research their customers for useful insights, and any queue research should be guided by the following:

- The customer has to be the primary focus and subject of queue research.
- Customer perceptions are more important than actual events.
- Customer perceptions are influenced by a large number of factors.
- Many of these factors are largely subjective and intangible.
- Customer perceptions and responses evolve through their shopping journey.
- Perceptions and influencing factors are situational and conditional.
- Perceptions and influencing factors will change over time.

2.1 Questions of the business

Retailers may ask of themselves a number of questions to explore the topic of queues.

- 1) What generally frustrates our customers about our queues?
- 2) How do our customers assess the queues to decide which one they wish to enter? This could identify factors such as how many people are in the queue, how long they perceive the queue will take based on how quickly it appears to be moving, or because they want to be served by their regular checkout operator.
- 3) What is an acceptable duration to queue to a customer? For example, this may be 1 minute, 4 minutes, or their tolerance vary according to time of day and day of week.
- 4) How do customers define a queue? Where does a queue start and end in a customer's view? For example, it could start when the customer first stands behind the person in-front, ends with their first item on the belt, or ends when their first item being scanned?
- 5) How does that queue definition vary for our different checkout types? For example queues may be seen differently for manned checkouts, lottery stations, self checkouts, mobile devices and so on.
- 6) Are customers more willing to queue for their preferred checkout type, than move to a shorter queue on a checkout type that isn't their first preference? For example, will people readily move to the customer service desk if the queues at manned checkouts are long?
- 7) What information, if any, could we give our customers to help them make a checkout selection? For example, if the store displayed the queue time by checkout type on screens?
- 8) How do customers react to being directed to an alternative queue by a member of staff? Do they appreciate it, are indifferent, or would they rather be left alone?
- 9) What is the customer view of staff suggesting checkout types to them to complement their basket size, as they approach the front end? For example, basket customers being directed to express lanes or self-checkouts. Do they mind the suggestion, do they feel pressured, or does it irritate them?
- 10) What could help ease the boredom or frustration of queues for customers? For example, doctor and hospital surgeries have TV screens to pass the time.

- 11) How do customers perceive our queues versus our competitors?
- 12) What would customers like us to do differently in the way we manage queues?

2.2 Measuring the effect of response evolution

Section 1.4.1 showed that a customer's perceptions and responses to service evolve according to the point they are at on their journey. Expectations, perceptions and reality do not necessarily coincide, so queue investigations should aim to study the customer in two ways:

- Measure correlation between a variable and the customer journey point (snapshot).
- Measure how the impact of factors changes throughout their journey (longitudinal).

The following takes Figure 1 and builds a question to capture the necessary information for a variety of research instruments.

Q: *At what point in the customer journey was this data gathered?*

1. Before entering the store
2. Whilst shopping in-store
3. Upon entering the queue
4. After leaving the checkout area
5. After leaving the store

2.3 When does waiting start and end?

Section 1.4.2 showed that the definition of a wait is important to a customer. The start and end point of a wait may differ for each customer, each checkout type, and even by physical context. , and this will impact attempts to measure the wait and make changes.

Any research should therefore seek to understand how each individual customer defines their wait, and then look for correlation between this and other wait-related factors. The following example offers a mechanism for gathering the customer's interpretation.

Q: Please indicate on the diagram below a) at what point in your journey do you feel you have started to queue, and b) at what point in your journey do you feel the checkout wait has ended?

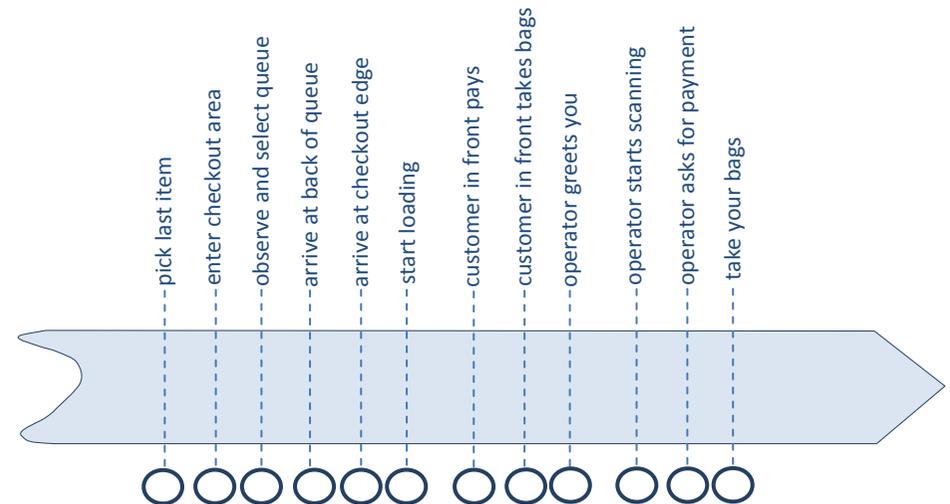


Figure 6. Researching the customer's wait

3 Improving queues

Literature provides some suggestions as to how to improve queues. More importantly, it is possible to derive a set of abstract patterns or categories of solutions that either provide solutions or offer areas in which to look for or develop these.

3.1 Solutions in literature

Technical and commercial literature offer suggestions to the problem of improving queues and customer wait times.

- Kumar et al.'s pros and cons of waiting time guarantees.
- Improvement not only raises shared customers' satisfaction with the focal retailer, it also concurrently lowers their satisfaction with the retailer's competitors (Kumar, 2005)
- An article by Retail Interiors (2006) says "...So, a quick look at Tensator's checklist for successful queue management: 1. Plan ahead - queues need space and need to be allowed for at the design stage; 2. Concentrate on flow. You can then minimise queue space; 3. Make your queue fair - first come first served always goes down well! 4. Allow space within the queue for in-queue merchandising where appropriate; 5. Be flexible - you may need to adapt your queuing area during peak periods."
- Diekmann (2005) studied the delegation of control down to local store level.

3.2 Improvement areas

Organisations looking for solutions can also explore areas of potential improvement. There are a number that are either proposed by literature or given inspiration by it:

- Approach queue improvement from different **perspectives**:
 - Bottom up, or top down.
 - Focus on customers or on colleague and operational efficiency.
 - Solve with technology, people or process.
 - Address expectations and perceptions, not just actuals.
- **Efficiency** approaches:
 - Faster processing.
 - Speed up the flow.
 - Increase capacity.
 - More checkouts at the front end.
 - Provide checkouts around the store, throughout the customer journey.
 - Manage the queue to be more efficient.

- Improve queue layout.
- Pool queues into a single line, although this can worsen perceptions even though it can improve efficiency (Lu et al 2013). Customers who are waiting in a long single queue are highly cognisant of the number of check out operators that have been assigned to the queue (Kakava and Erasmus, 2012).
- **Process** approaches:
 - Dynamic response to demand:
 - Use alternative queuing strategies dependent on the traffic in the store at a specific point in time; because theoretically none of the service process designs provide the single best solution for all operating conditions.
 - Additional, temporary lanes in peak periods.
 - Save time elsewhere.
 - Pre-shop for the customer.
 - Eliminate empty time:
 - a single queue versus multiple queues.
 - proper training of contact personnel.
 - Improve service managers' ability to control customer perception (Davis and Heineke, 1994).
 - Find a way to give the customer less to process:
 - Pre-payment.
 - Mobile hand-held scanners.
- **People** approaches:
 - Show empathy by making provision for customers such as the elderly or the handicapped who are unable to stand for long (Kakava and Erasmus, 2012).
 - Remove queues altogether.
 - Distract or entertain the customer:
 - Music
 - encourage talking to other people

- provide captivating displays, a television monitor with interesting visuals in the waiting area, books or magazines.
- customers who are in a hurry may however resent further distractions and should preferably be diverted to express checkout lanes (Kakava and Erasmus, 2012).
- Add utility to the queue:
 - make it worthwhile.
 - allow the customer to complete chores and tasks, like the lottery.
- Waiting area attractiveness:
 - attractive décor.
- Remove the gaps:
 - conceal staff who are involved in administrative duties and who are not meant to serve customers in the queues.
- Excuse the wait:
 - a consumer who has waited in a queue longer than expected will be more forgiving when judging the service quality of the store if a valid reason for an extensive wait in the store is provided.
 - a smiling face and an apology at the end of a queue make waiting more bearable
- Address subjective perceptions.
- Nudges and subliminal queue messages/suggestions:
 - informing and guiding the customer about their queue choices.
 - influence customer expectations, and subsequent reactions.

4 Glossary

Definitions for terms encountered in queuing literature:

Balking	refusing to join a queue
Jockeying	swapping queues and returning
Queue	the primary cause of waiting evidence that a wait is about to commence the process of waiting for service an (orderly) line of people waiting for service
Reneging	abandoning the queue before being served
Skips	skipping over a customer to serve the next in the queue
Slips	slipping past other customers in the queue to get served first
Social justice	a reaction to the perceived violation of the first-in, first-out rule
Temporal orientation	how a person processes and perceives a sequence of events

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