The Future of Retail Grocery Store Labor

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Executive Summary

We report here the results of a study to learn about the evolving store labor practices of leading (mostly grocery) retailers, including the current state of practice, what problems the retailers are struggling with currently, and implications for the industry. We first report on a series of interviews with senior executives at 15 grocery retailers and then present a tabulation of results of a written survey completed by 60 retail executives in 10 countries. An Appendix provides a survey of relevant published literature, the questionnaire sent to interviewees to guide our discussions with them, the written survey questions and a tabulation of survey responses segmented by U.S. retailers, non U.S. retailers and academics.

There are three main insights from our study: 1) labor market conditions have been challenging in recent months, and this is not likely to change in the near future; 2) retailers need to rethink their approach to online grocery; and 3) thinking about labor as an asset to leverage rather than a cost to bear can be a way forward.

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1. Introduction & Research Objectives

Managing the staff within a retail store well has an enormous positive impact on results. The retail store staff is both a significant expense item (usually the second-largest expense after the Cost of Goods Sold) and a key revenue driver. Fisher, Gallino and Netessine (2019) reports that two retailers that launched initiatives to optimize the level of staffing and improve training saw revenue increases between 5 and 6 percent.

Managing retail store staffing has always been challenging, but several recent trends have made it important to take a fresh look at this topic. Online options have made excellent customer service in the store even more critical. At the same time, likely increases in minimum wages create pressure for retailers to be parsimonious with staffing levels. New technologies, like self-checkout, in-store robots (that can scan shelves to check inventory levels and answer customer questions), and electronic shelf tags, offer opportunities to enhance store operations. Finally, omnichannel retailing presents managers with new options and a more diverse set of functions a store must perform. For example, should online orders be fulfilled during the day or overnight, which is less disruptive of normal operations but entails higher overtime pay?

We report here the results of a study to learn about the evolving store labor practices of leading (mostly grocery) retailers. We seek to 1) understand the current state of practice, 2) learn what problems retailers are struggling with currently, and 3) identify implications for the industry.

We began with a series of interviews with senior executives at 15 grocery retailers. Seven of these interviews were with managers from the US, five from Europe, and the rest from South America, and Australia. Mostly these were single one-hour interviews, although we had multiple one-hour interviews in some cases. These interviews enabled us to understand current issues the retailers are struggling with and to design a survey to be completed by individual executives within the retailers and focused in a more precise way on particular issues. This survey was completed by 60 respondents in 10 countries.

2. Interview Results

We conducted approximately 19 hours of interviews with executives at 15 leading retailers in North and South America, Europe, and Australia. Our agreement with these retailers prevents us from naming them or associating comments with specific retailers. Still, we can say they were retailers that were outstanding in their size and practices.

Our goal in these interviews is to 1) gain facts about labor practice in a free-flowing format, 2) understand what issues to investigate further in our written survey, and 3) build a relationship for further interaction, including their response to our written survey.

Prior to the interviews, we sent them a list of questions and then heard their responses to these questions. We report the list of questions in Appendix B.

We summarize below some key points from these interviews.

2.1. Setting store staffing levels

Across all retail formats, not just grocery, store associates do two things – customer service and task work, or take care of customers and take care of the store. We learned in the interviews that in grocery, the associates' jobs are virtually 100% task work taking care of the store, including checkout, shelf replenishment, facing, receiving, and cleaning. The most common customer interaction is dealing with questions like 'where's the catsup?', to which associates are instructed to point and say 'it's over there,' rather than walking the customer to the product.

Despite the limited customer service aspect of retailing, two or three of the retailers we interviewed still set their payroll budget to a percent of forecasted sales and used the same percentage for all stores. The reasoning for this approach is that it's simple and most of the task work is proportional to customer volume.

One retailer used a hybrid approach in which they divided their labor into fixed labor, required even if zero customers arrived in a day, and variable, dependent on traffic in the departments of the store. The more common approach is to use the industrial engineering (aka time and motion) approach used in industrial contexts like determining the time to do all the steps in assembling a car so as to balance the work on an auto assembly line between workstations. The argument we heard for this approach, as opposed to using a percentage of revenue, is that two stores, one selling 100 bottles of $10 wine and the other selling 100 bottles of $20 wine, will need the same labor but have different revenue.

In this approach, you first forecast the volume of work to be done for all of the store functions (checkout, shelf replenishment, facing, cleaning, receiving, etc.), then determine how long to do one unit of each activity, and finally determine required labor hours as a product of activity times multiplied by the amount of activity.

The retailers varied considerably in 1) how they forecast activity, 2) how they measured activity times, 3) the level of granularity of the schedule, 4) the frequency of updates to those schedules, and 5) the relative roles of store operations, store managers and corporate finance.

To forecast activity, the retailers mostly used averages of past history, appropriate to the day of the week they were forecasting and adjusted for any special events. Most sought to identify and forecast every activity within a store that required labor, but one argued that this was overly complicated and instead forecasted the three big labor drivers for them – checkout, shelf replenishment, and shelf facing. This was 60% of their labor. Then, they'd forecast the remaining labor need as proportional to this. They argued (convincingly) that this was simpler and more accurate than the more granular approaches.

Not part of this study, but as part of another project, we learned about a retailer that had an interesting approach to dealing with forecast errors in customer volume forecasts and the associated need for

store associates. For their format, the associate need was mostly driven by traffic, which was influenced in part by the weather. They had a traffic forecast for the next day, with a margin of error on the forecast. They would staff to the high side of the margin of error on the forecast. Some hours into the day, they knew the weather and had a much more accurate forecast of the staffing needs that day. If that need were less than the number of staff currently working in the store, they would send a text message to the smart phones of all associates in the store with an offer to go home early. They always got enough 'takers' on this offer to 'clear the market' on their need for associates.

The retailers varied greatly in the level of detail of their assessments of activity times. One retailer maintained 2,500 labor standards developed based on filming and timing the activities being done (such as baking a cake) under 'laboratory' conditions and, in some cases, adjusting the method used to enhance productivity. They even allowed in their labor planning for a forecast of cakes made but not sold and for scans at checkout that had to be repeated. This contrasts markedly with another retailer that used a simple standard that a checkout person does 25 scans per minute.

Another retailer had maintained 400 standard times but cut to 100 for both simplicity and accuracy. In the old system, if they wanted to know, for example, the time to make a sandwich, this time might have been computed as the sum of the times to perform the steps in making a sandwich – get bread, get the meat, apply the meet, get cheese, etc. The advantage of this approach is that you can then estimate the time for other types of sandwiches, e.g., one without cheese, from these elemental times. Nonetheless, they gravitated over times to a process where they simply timed store people making sandwiches multiple times and took an average. This they found to be simpler and more accurate. In some cases, the standards are store specific if the design and layout of the store impact process times.

In terms of temporal granularity, the most common process was a monthly cadence wherein corporate gave each store a monthly payroll budget. The store manager then allocated this budget to hours of the week and to specific individuals to work those hours. That later step is complicated by laws that govern the nature of employee schedules. Some of the retailers used commercial software e.g. Kronos, that could assist in creating legal employee schedules. In a few cases planning was weekly rather than monthly, and in one case store payroll budgets were set annually, which surprised us as way too long a planning horizon, although it was updated quarterly.

If store scheduling needs to balance the needs of customers with the needs of associates, most of the systems are tilted towards the needs of the customers. That said, a three of the retailers impressed us with the passion they brought to taking care of their associates. For sure, this included above market wages and benefits, but also humane schedules announced several weeks in advance. One example given was that the hours of a schedule for a mother working in the store would align with when her kids were in school. These retailers generally had low employee turnover and excellent financial results, driven in part by the fact that they had long-term, experienced, and motivated associates working in their stores (a fact we can attest to as customers of one of the retailers).

Lastly, we turn to the relative role of corporate store operations, store managers, and corporate finance in labor scheduling. As mentioned, the typical interaction between corporate and stores is that the

former gave the stores a budget which they used to create detailed schedules. In some cases, stores could make a case for, and be given, a bigger budget. This could result in the store manager earning a bigger, or smaller, bonus payment, depending on whether their predicted higher activity used to justify more people actually materialized.

One role finance often played in the labor planning process seemed somewhat dysfunctional to us (but perhaps that's because we're ops guys). After the corporate store operations team engaged in a rigorous process to develop labor budgets based on the work that needed to be done in the stores and industrial engineering time and motion studies to estimate the required labor to do each component of that work, and then coordinated with stores to incorporate their input, we were told that the finance function at the retailer would then slash that budget by x%.

We find ourselves agreeing with the comment one of the retailers had on the finance role in the labor planning process: "It's crazy!" Even crazier, at one of the retailers, finance called this their 'productivity initiative', a kind of delusional denial of reality in which if they only decree the work should take x% less time, it will. Of course, cutting the labor budget by x% doesn't cut the work by x%, so what happens at the store level is that discretionary work, like cleaning, doesn't get done.

Why does finance do this? At public retailers, we've seen it driven by the quarterly financial reporting. If there are three weeks to go in a quarter and a retailer is headed to a profit number a little less than the guidance they have provided, one of the few things they can do to correct the problem is cut labor in the store.

And possibly this can work for a while. A dirty store for three weeks is not going to immediately produce a drop in revenue, but eventually it will. And because the connection between store labor and revenue is unknown, this practice can persist.

One retail Chief Operating Officer told us of their effort to correct this misperception of the link between revenue and staffing. With three weeks left in the quarter, the CFO asked to meet with the COO. Here's their exchange:

2.2. Reducing labor needs through process improvement and automation

Of course, reducing store labor is a good thing, IF it's done through initiatives that truly take work out of the stores and not by arbitrary budget cuts.

All of the retailers we talked with lamented rising wages and the difficulty of finding people, especially since they have to compete for labor with the likes of Uber. One retailer who was unionized told us they actually paid wages above what the three-year contract had negotiated. The market was a better negotiator than the union!

The retailers talked about three ways they reduce labor: 1) stop doing activities where the value doesn't warrant the effort, 2) process changes, and 3) technology. An example of the first one mentioned is to change assortments less frequently, reducing the labor needed for resetting planograms.

A common process change mentioned was to take work out of stores and do it centrally, where it could be done more efficiently at scale. Examples were as diverse as having calls to the store number go to a central call center, to delivering partially prepared pizzas to a store that sold cooked pizzas, to delivering cheese to the deli presliced.

One retailer selling prepared cakes told us that a process change from scooping frosting out of a container to having the frosting in an applicator with a tip saved 3 seconds per cake. This said to us that process improvement is a game of seconds, in which many small process changes, each saving just a few seconds, can collectively add up to meaningful labor savings.

In terms of in-store technology, the most common was self-checkout (one of the retailers had 80% self-checkout) or handheld devices customers could use to scan items as they put them in their carts. Other commonly mentioned examples were electronic shelf tags and machines for cleaning floors, shelves, and restrooms.

The retailers were less enthusiastic about robots. One commented that between shoppers and e-commerce pickers, their stores were too crowded for robots.

One successful use by Giant of an in-store robot (named Marty) has been extensively reported on in the news. Pictures of Marty in action are below. Following the 'crawl, walk, run' paradigm, Marty is first doing the relatively simple task of looking for floor spills, then will check for inventory holes on the shelf and price tag compliance. Eventually, Marty will answer customer questions at a time when customers will have gotten used to seeing Marty in the store for many months, so it will be like interacting with an old friend.
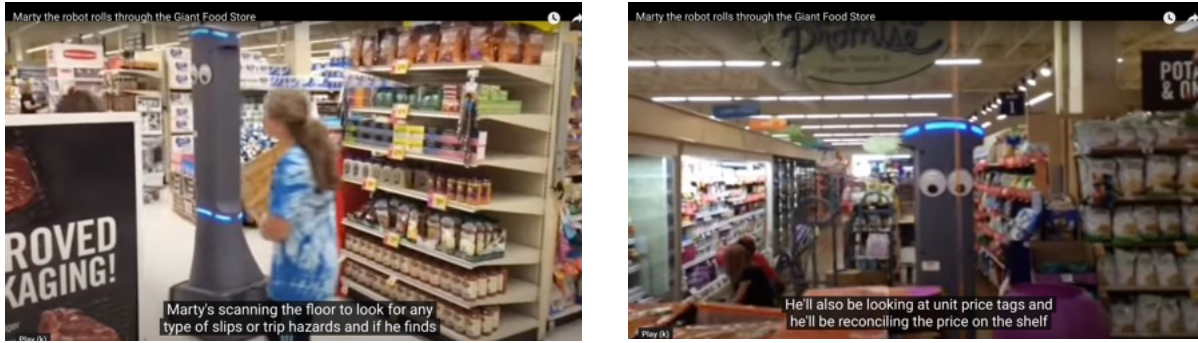
Figure 1. Marty in Action

Besides hardware to automate physical work in stores, retailers are adopting software to help with intellectual tasks. One prime example is inventory auto-replenishment, using past sales history to forecast future sales and combing that with current inventory levels to issue replenishment orders.

One retailer who adopted auto-replenishment said they saved 10 hours per store per day in planning time and walking the aisles to visually identify where more inventory is needed. They also emphasized the need for accurate inventory data for auto-replenishment to work, and spoke with great pride about how they recognized this and invested a portion of the 10 hours saved in inventory counts and other activities to bring their inventory record accuracy to 99%. Their assessment was that investing in inventory record accuracy paid off in simplifying operations. Without accurate inventory, one is constantly engaged in firefighting to correct mistakes. See DeHoratius and Raman (2008) for a further discussion of inventory record accuracy.

2.3 Training

All of the retailers engaged in extensive training, both to onboard new employees and to train existing employees in new processes. Much of this was on-the-job training, although some used videos of how to do processes. See Fisher, Gallino, and Netessine (2020) for a discussion of retail training by videos.

We saw considerable variation in the level of cross-training to enable store associates to perform multiple tasks. All retailers required their associates to be more versatile in smaller stores. Moreover, certain functions, like butcher and bakery, require specialists.

Some retailers used cross-training to enable more level schedules for workers. Retailers who gave their associates a relatively level schedule, rather than varying store headcount aggressively in reaction to traffic, had to deal with having a higher number of associates in the store when traffic was low. They dealt with this by having associates staff checkout when traffic was high and restock shelves when traffic was low.

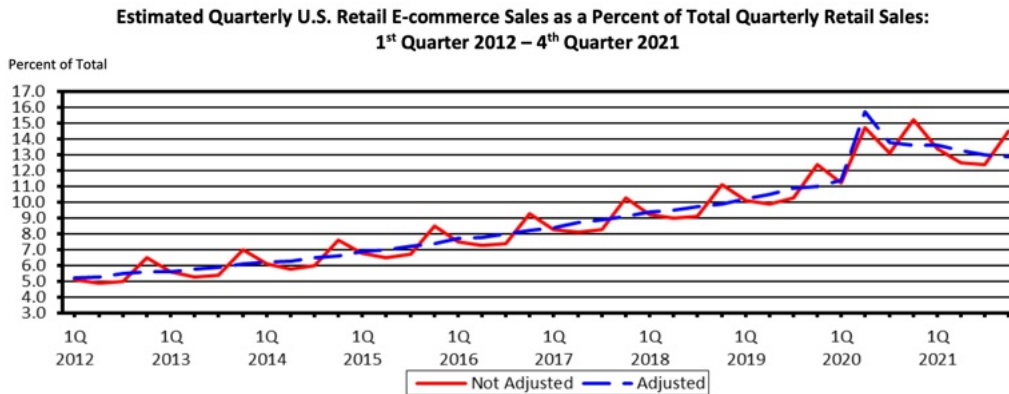## 2.4 Backroom to shelf replenishment

We saw four ways of restocking shelves. The conventional was an associate walks the aisles, spots where more inventory is needed and brings it from the backroom to the shelf. A second way is what we already discussed, have a robot like Marty scan the shelves and send a restocking message where needed. A third way was shown to us on a Target store visit they hosted some years ago. They use POS sales at checkout to update inventory and hourly send restocking messages to associates. They also have an uncommonly well-organized backroom with every SKU in a logical place that makes them easy to find.

Finally, Zara, while not a grocer, has pioneered in putting an RFID chip on every product unit. This lets them scan inventory levels in their stores hourly and then bring inventory from the backroom to shelves as needed. We don't see this approach fitting grocery, but we mention it as an interesting development. See Moreno (2021) for more details.

2.5 Incorporating e-commerce fulfillment into store operations

The graph below should come as no surprise to anyone who has bought groceries since Covid hit in March 2020. Starting in March 2020, online sales surged, and much of that surge was in grocery stores.

As this surge hit, grocers needed to ramp up delivery quickly, and the quickest (and most expensive) way to do this was to have store associates pick products from the shelves against shopping lists based on customer orders placed online. Then customers pick up their order from the store or have it delivered.

Estimated Quarterly U.S. Retail E-commerce Sales as a Percent of Total Quarterly Retail Sales:
1st Quarter 2012 – 4th Quarter 2021

Source: US Census Bureau News, US Department of Commerce, Washington, DC, February 18, 2022

Figure 2. Online sales surged starting Q2 2020

The comments we heard in our interviews about this approach included "At times it's just like its chaos." (referring to pickers getting in the way of each other and shoppers) and "just not a scalable model." And the inefficiency inherent in the double handling of moving product from the backroom to the shelf and then handling again to pick for a customer is obvious.

Many retailers we talked to were experimenting with tweaks to this model, including picking from the store's backroom (to avoid the double handling of moving to the shelf), filling online orders from a fulfillment center, or from a mini fulfillment center adjacent to a store. The other issue they pondered was the best time to pick for online orders, at night, when congestion in the store is avoided but wages are higher, or during the day. Most elected to pick during the day.

One obvious question is whether the online surge will abate post-Covid. The above graph shows it already has to some extent. But if online orders persist at a high level, we think the current system needs to be rethought. We've been involved in studies to choose an optimal number of fulfillment centers to trade-off fixed costs vs. delivery speed and cost, and have never seen the optimal number of fulfillment centers be anywhere close to the number of stores most retailers have. Plus, there is the multiple handling of shipping from an FC to a store's backroom and then to the shelf for picking, which can't possibly be profitable. One possible solution suggested is to pick fresh from stores, dry goods from an FC for delivery to a store, and finally customer pickup of the combined order.

2.6 Leadership

Interestingly, only one person we talked to mentioned the importance of motivation and leadership, and this was a franchisee who owned his own store. His store was consistently ranked the number one store in his region. His motivational pitch to his employees was that all the competitor stores carried the same products at the same prices, so whether customers come to our store, or a competitor store, depends on all of you and how well you serve them. Almost like a sports coach

using pride in winning to motivate players, this seemed to elicit the best efforts from his associates. Interacting with this modern-day small-scale Sam Walton made us wonder if the role of personal leadership deserves more emphasis in retailing.

3. Managerial Survey

This section shares the results and discusses the implications of the survey we designed to help us quantify the insights we obtained during our interviews.

One of our main goals was to obtain responses from relevant players in the retail industry worldwide. The retailers represented in our sample operate in more than ten different countries, including Canada, Estonia, France, Germany, Mexico, New Zealand, Norway, Portugal, Russia, Spain, The Netherlands, the United Kingdom, and the United States.

The questions we included in the survey are detailed in Appendix C. In what follows we discuss the results of this survey and its implications.

3.1. Survey Introduction

In addition to the global representation, it is important to emphasize that the respondents to our survey are experienced managers with high levels of responsibility within their organizations. One of the survey's questions explicitly collected this information by asking how many report levels were between the respondent and the company's CEO. The average response for this question was two. To further characterize the respondent's experience, we asked the participants to report how many stores the retailer they work for has. The median number of stores the participants reported was 405.

These two questions help us confirm that the respondents have meaningful responsibility within their organization. In addition, we validate that these organizations have a large operation and are a good representative of the market where they operate. We collected 15 respondents from the United States and 20 from other parts of the world.

In addition to our main two group of respondents, retail executives who are decision-makers on store labor issues within their organizations, in the US and worldwide, we shared the survey with one additional group. We collected 25 responses from highly respected academics mostly interested in their research or teaching activities in the retail industry.

These three different streams of responses help us better reflect on the responses we obtained and allow us to contrast the results obtained from the managers in US retail with other parts of the world and the perspective of academics.

In what follows, we report our main findings. For clarity in the exposition, we will report our main findings based on the managers' responses. While discussing the results obtained for this focal group, we will highlight relevant points when comparing these results with the academics. In the appendix, we report the structure of the survey and the responses obtained from the different groups.

3.2. Survey Discussion

In the first two questions for the survey, we asked participants to report their best estimate of current and future (in the next five years) total retail sales allocation of sales revenue percent across different relevant transaction modes.

The next figures report the summary of the participant's responses.
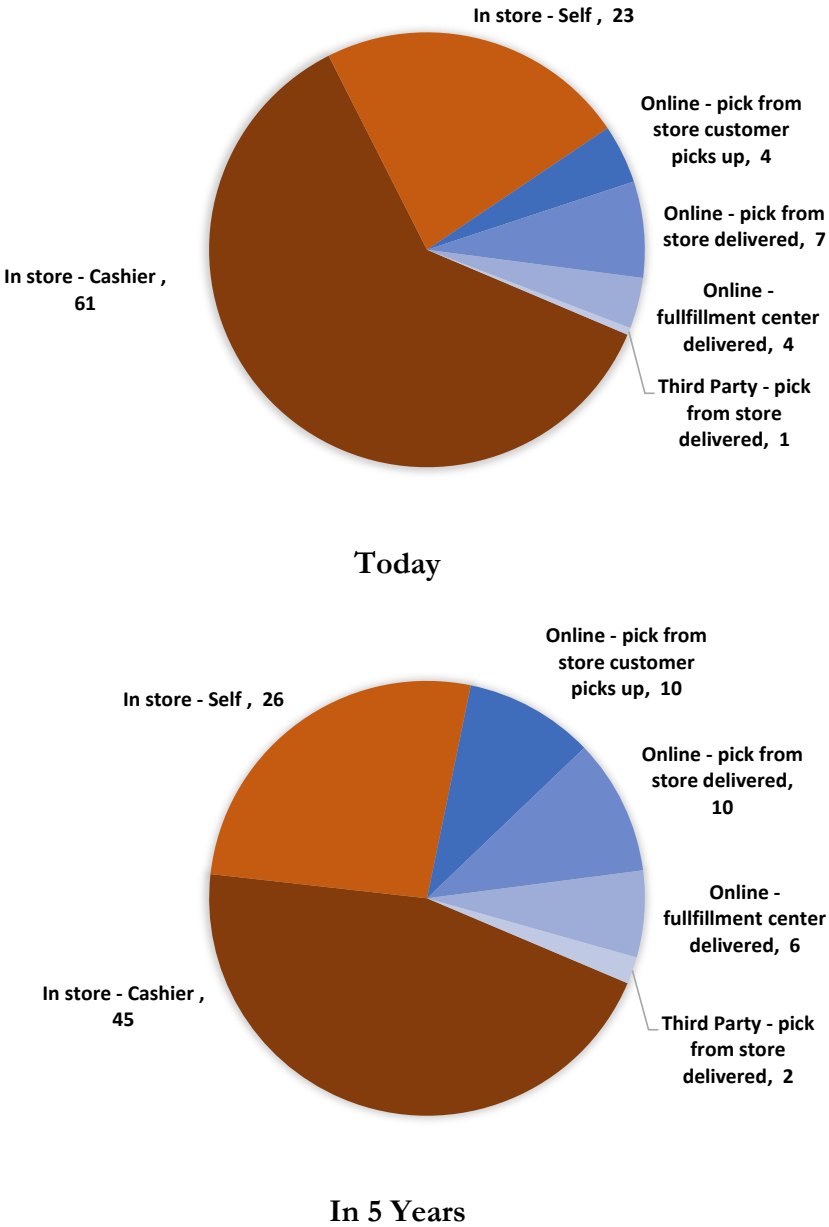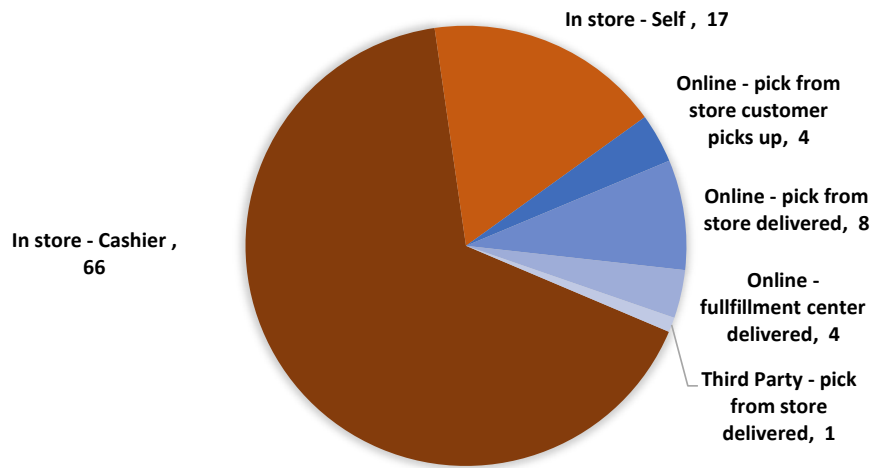

Today

In 5 Years

Figure 3a. US Responses. Thinking about your current total retail sales, what is your best estimate of allocation of sales revenue percent across the following transaction modes.

Today
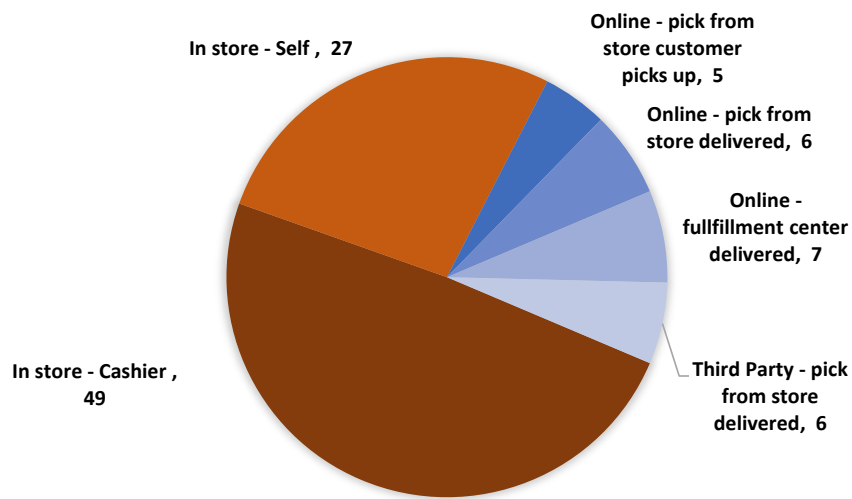
In 5 Years

Figure 3b. Non-US Responses. Thinking about your current total retail sales, what is your best estimate of the allocation of sales revenue percent across the following transaction modes.

In the United States almost every transaction is fulfilled from the store and, according to the participants, this is a trend that is not going to change meaningfully over the next five years. The expectation is that retailers will fulfill 5 percent of their orders from a distribution center in the next five years.

Furthermore, today customers pick 84 percent of transactions in the store. This type of transaction will still be the primary revenue driver in five years. However, its share is expected to drop from 84 percent to 71 percent. It is also relevant to highlight that today, almost 30 percent of those customer

picked transactions are self-checkout, but in the next five years, that portion would grow to more than 35 percent.

US

Non-US
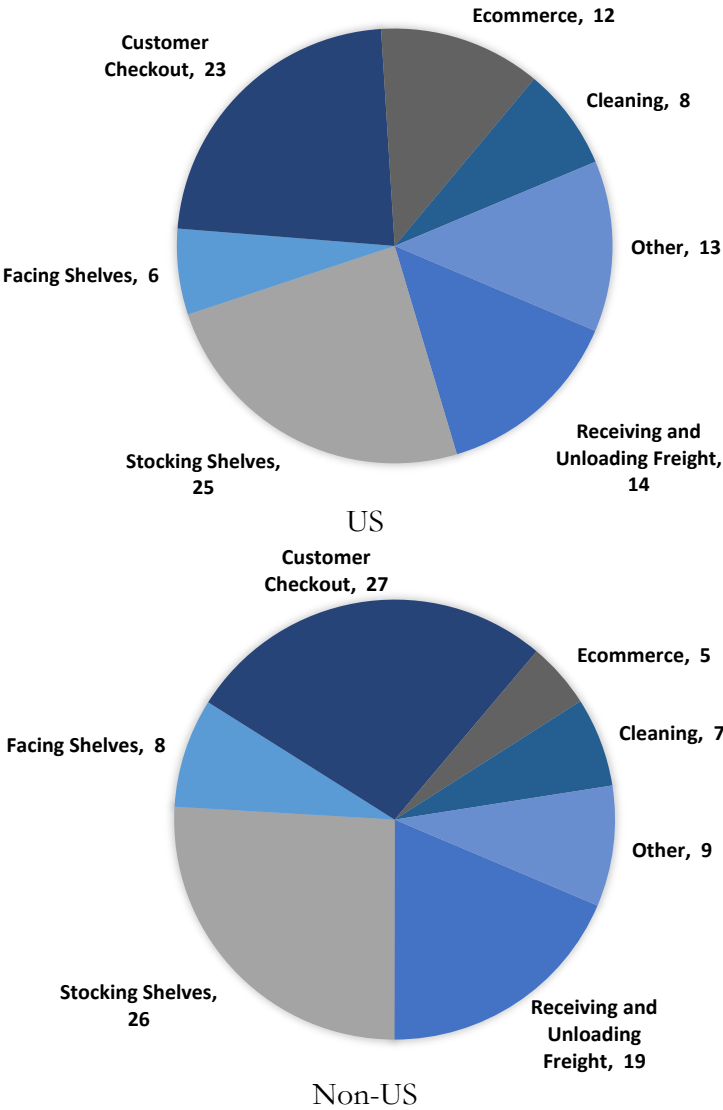
Figure 4. Thinking now about your current allocation of your hourly store associate hours by work process, what is your best estimate on the current percentage of the total labor hours in your stores associated with the following broad work areas.

Retail managers expect online transactions to capture a more significant portion of the revenue. However, it is interesting to note that the store will still be at the heart of fulfillment for most of those orders.

This dynamic is very similar when we look at what retailers respond outside the US. The trend is also increasing for online transactions. However, similar to the US, the expectation is that only 7 percent of the orders will be fulfilled from a distribution center.

Question 3 capture the manager's estimate for the current allocation of store associate hours for different processes. These results are shown in Figure 4.

Question 4 captures the manager's estimate of what percentage improvement in the current labor hours can be obtained for the tasks of store associate hours for different processes. These results are shown in Figure 5.
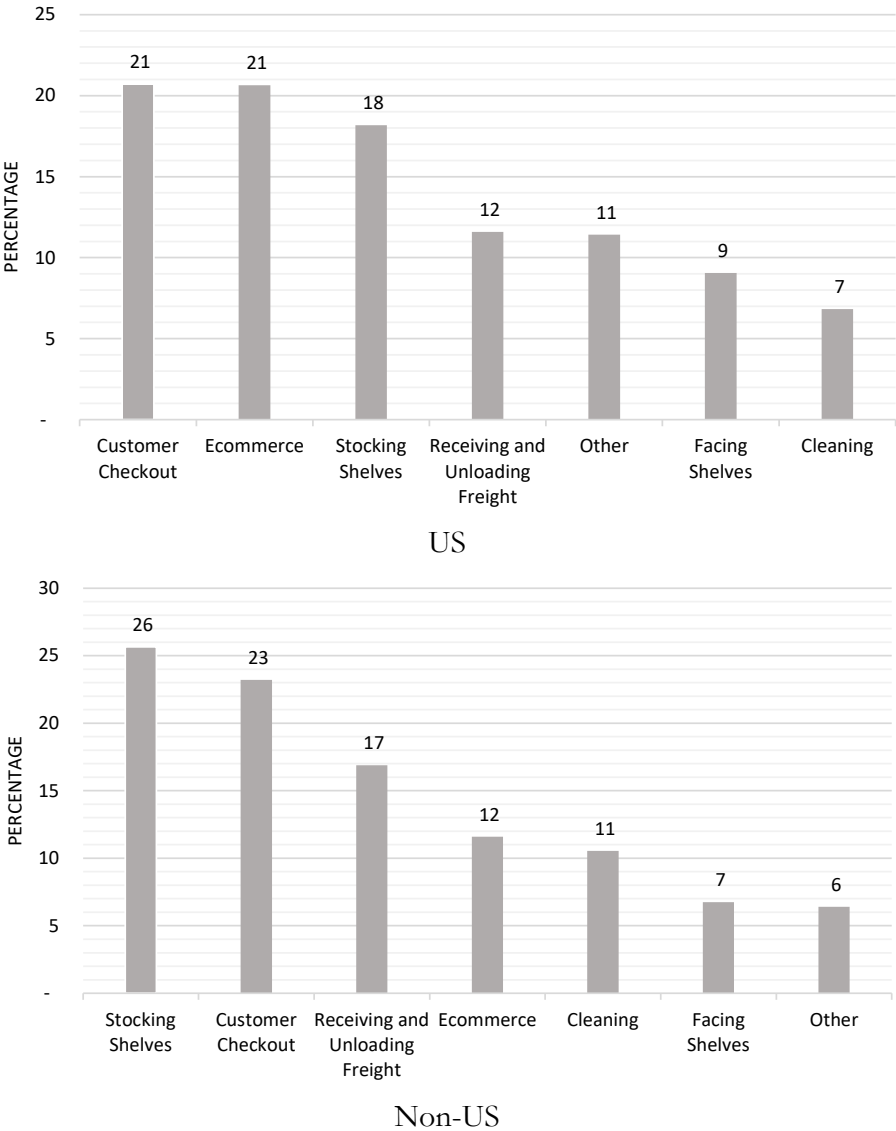

US

Non-US

Figure 5. With productivity in mind, what percentage improvement in your current hours allocated to each of the work areas do you believe can be achieved in the next five years?

The results of questions 3 and 4 present a consistent view across the two main factors that require labor: stocking shelves and customer checkouts. These are the main drivers of labor hours and where most of the reductions are expected both in the US and worldwide.

The number of hours associated with e-commerce activities seems high when considering the revenue portion that this online channel generates. Therefore, it is reasonable to observe in Figure 5 that the US retailers' expectation is to reduce a disproportionate number of hours corresponding to this activity. Note that outside the US we don't find a similar response when it comes to the expected reduction in ecommerce activities.

In our next question, we asked about efficiency gains in labor practices. In particular, we wanted to understand by which mechanism managers anticipate obtaining the efficiency gains discussed in the previous point. We presented three different alternatives: process elimination, process improvement, and process automation. The result to this question is presented in Figure 6.

Managers report that most improvements are expected to be obtained from improving the processes. However, the fraction of improvement is expected to be obtained from process automation and process elimination is also meaningful. This pattern is similar across both groups. While we are not quantifying the type of processes planned to be eliminated, it seems to be the case that there is room to consider process elimination. This is consistent with the insight we obtained during our interviews. This process elimination is most likely capturing not an elimination of the task altogether, but the transfer of tasks currently done in the store to central locations to gain scale and efficiency and move out of the store some of those tasks.

In our next survey question, we dig deeper into the process automation efforts. We try to disentangle what technologies retailers are considering for achieving these productivity gains. We asked about a list of different new technologies that retailers and grocery retailers, particularly, are thinking of incorporating.

US

Non-US
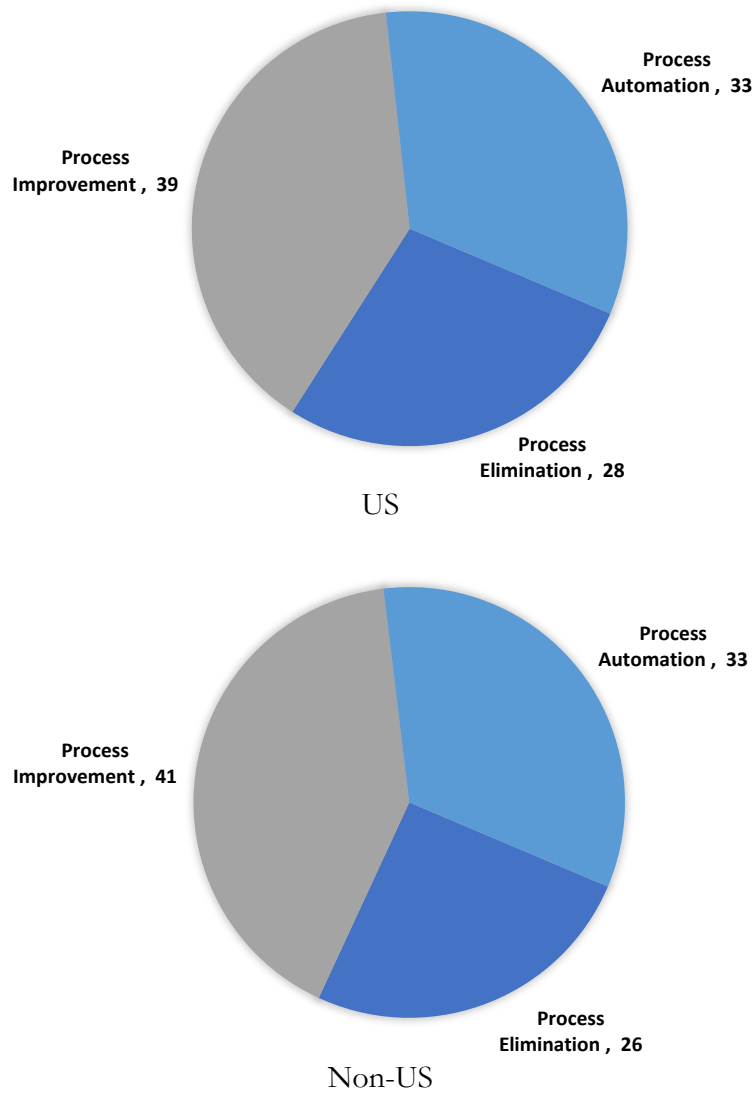
Figure 6. What percentage of the improvement will come from these approaches?

The next section of the survey includes a list of relevant technologies that have been studied, implemented, or piloted in the industry. We created the list of technologies based on our review of the literature, our own expertise on the topic, and what we learned during our interviews.

We asked participants to what extent these different technologies are used within their organization. At the same time, we also wanted to understand if some of these technologies are being piloted or have been discarded in previous pilot efforts.

Table 1 below reports a summary of the main responses. The detail version of these responses is reported in the appendix.

	US
Used or Scaled	• Self-checkout fixed station • Remote Temperature Monitoring • WFM systems for scheduling, planning, task management, etc.
Piloted or Implemented	• Self-checkout (customer uses store supplied device) • Pallet level RFID • Robots to keep store safe and clean
Not Used or Discarded	• Robots to answer customer questions • Case level RFID • Robots to scan shelves for stock-outs

Table 1. Thinking about new technologies, to what extent do you imagine the following technologies would have been deployed across your business in five years' time?

Table 1 reports the technologies that received the highest percentage of responses across three categories for US retailers. First, the technologies that are currently used or scaled. Next, those technologies that are being piloted or in the early stages of implementation. Finally, those technologies that have been discarded or not used by most retailers.

Across those technologies that are being scaled or used, the self-checkout solutions are the type of technology that gained most traction in the US. Other technologies that retailers have now used for a number of years include remote temperature monitoring and systems that will help manage their planning and in-store schedules.

Next, it is reasonable to follow closely those technologies that are implemented and piloted. In many cases, the reason these are not extensively used today might be related to the current cost-benefit analysis. However, the economic landscape and labor market forces in the coming years make some of these tested technologies very attractive. This is an interesting category because it shows the most promising technologies according to the retailers. We see here that self-checkout with the customer using the store supply device is at the highest end of this category.

We find RFID at the pallet level as a promising technology. It is reasonable that it is hard to justify RFID technology at the item or case level at the current cost. Still, the technology is being implemented with larger deliveries. Another technology relevant in this category are robots to keep the store safe and clean. Electronic shelf labels are also high when we look at what is being currently scaled.

Under "Not used", we can see which one of those new technologies are highest in the not used category. The results suggest that robots to answer customer questions and RFID technologies are examples of technologies that are currently not used in the retail grocery space. Next, we have technologies that have been discarded. These are technologies that the retailers have tried and have

decided not to incorporate for one reason, or another have decided not to incorporate. Three of the technologies that appear highest in this category of discarded technologies are the self-checkout for customers using their own devices and robots to scan shelves for stockouts.

In addition to receiving feedback on different technologies we proposed, we asked managers an open-ended question to allow participants to suggest other technologies they are considering or are implementing in their stores. The technologies mentioned fall into different categories around electronic safe and shared keys to manage deliveries, production planning and real-time inventory management, with a special focus on perishable products, and automation for e-commerce operations such as automated fulfillment centers and stores. Finally, other managers mentioned artificial intelligence for queue management and efficient traditional checkout operation.

Today

In 5 Years
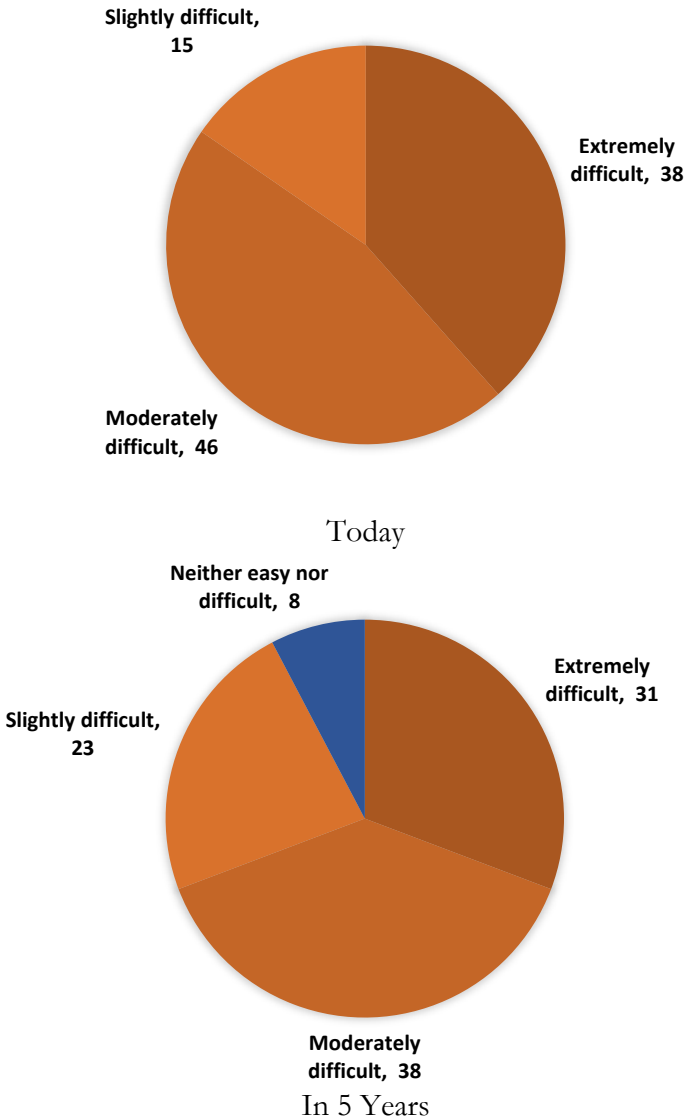
Figure 7a. US Responses. How easy or hard is it to find employees for store operations activities?

Today

In 5 Years
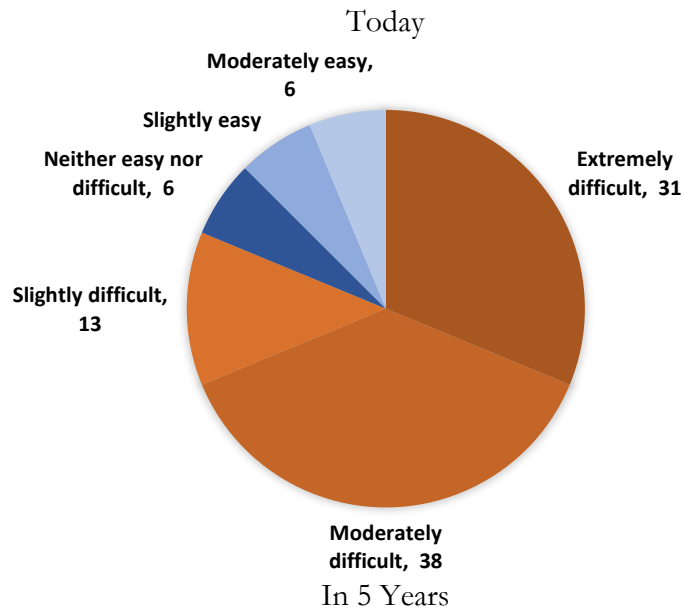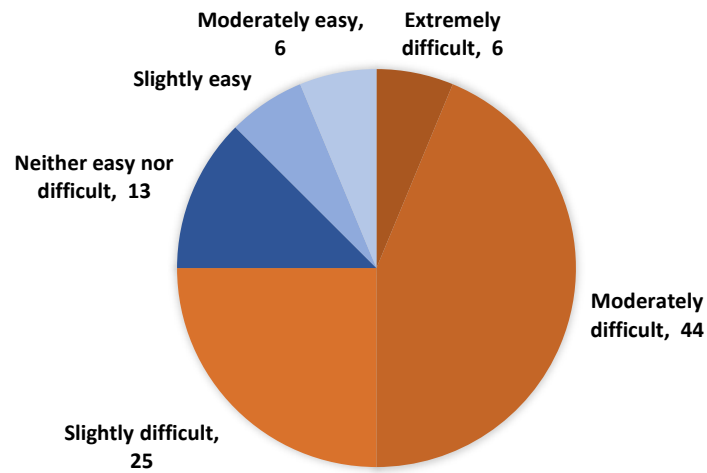
Figure 7b. Non-US Responses. How easy or hard is it to find employees for store operations activities?

Next, we wanted to understand what the consensus is regarding how easy or difficult it is to find labor for the different in-store tasks. Figure 7 shows that the consensus is that this is a difficult task, and there are almost no responses arguing for this being an easy task. Most responses fall into different degrees of difficulty in finding workers for the stores, with moderately difficult being the most common response.

Next, we ask about how managers anticipate that this situation will evolve in the next five years. Retailers anticipate that the challenge to find labor will persist in the coming years. Figure 7 still shows

a higher weight on the extremely difficult-to-find labor going forward. We will come back to this point when we discuss our conclusions.

Another way to quantify the challenges to finding labor for the stores can be obtained by asking about the salary increase that grocery retailers anticipate they will need to incur in the coming years. The average salary increase reported by the managers was 21.6%, with a median of 20% for our US respondents. This is a significant increase for a relatively short time. These results are similar outside the US. This result only reinforces the challenge retailers anticipate they will face when finding labor for their stores.

Finally, in the last question of the survey, we ask about the role of third parties vendors, broker representatives, and merchandisers. There is no clear consensus across the grocery retailers on the trend of the participation of these groups in helping with in-store labor. While the general trend suggests that the expectation is that this support will go down, it is also true that these responses have a large standard deviation. This indicates no clear or consistent view of what might happen within these groups. This result did not come as a surprise since it is consistent with the feedback we received during our interviews. Managers did not consider this as a meaningful driver of labor in the stores today and did not expect meaningful changes going forward.

3.3. Survey Discussion - Academics

In this section, we discuss the perspective that academics bring to these questions. The academics responding to the survey regularly participate in the Consortium on Operational Excellence in Retailing (COER). This consortium has an annual meeting that alternates between the Wharton School and Harvard Business School and has been running for 25 years. The academics that responded to the survey focus their research efforts on the retail industry, are knowledgeable about the trends, and regularly interact with retailers worldwide.

This group of respondents was explicitly asked to respond thinking about what they anticipate are the changes and perspectives in grocery retail.

It is interesting to see, in general, that academics have a consistent view with the responses from retail executives. However, they overestimate the portion of online transactions today and in the coming years. Academics have the sense that the migration to different forms of online orders is going to be much more aggressive.

When responding about the allocation of current hours, the academics have a view that is consistent with what retailers report. However, when we look at what is going to happen in terms of improvements in these labor hours, the academics anticipate a much more concentrated effort around self-check-outs and improvements in the e-commerce space. While these results are consistent with what the grocery managers express, the academic expectations are it will be possible to achieve higher labor reductions in those two areas.

When we look at how improvements are going to be achieved, the results are similar to what happened with the retailers outside grocery. There is an expectation that most of these improvements are going to come from some version of automation.

When we look at the results for the specific technologies included in the survey, academics tend to believe that there is more piloting and early-stage implementation than retailers reported.

These results can be explained by the type of conversations and interests that many of these academics have in this space. It is also possible that academics have a more optimistic view than practitioners on the scalability of some of these technologies that are currently being piloted or in the early stages of implementation.

There is a consensus among the responses from academics that finding labor is not easy today, and similar to what the grocery retailers have responded, the task is deemed difficult from the academic perspective as well. However, if we compare the grocery retailers and the academics, it seems to be the case that the academics believe that the situation is more challenging today than it will be five years from now. This difference is interesting because, once again, it suggests a more optimistic view of what will happen in the labor market.

These results also translate into what the academics anticipate will be the salary increase going forward. The expected change is more consistent with what the retailers in the US anticipate and resonates with a more optimistic prospect in the labor markets.

4. Conclusions

In this section, we discuss our main conclusions from this study. These are informed and derived from the literature review, the in-depth interviews, and the responses to the survey. In our view, there are three main insights from our study: 1) labor market conditions have been challenging in recent months, and this is not likely to change in the near future; 2) retailers need to rethink their approach to online grocery; 3) thinking about labor as an asset to leverage rather than a cost to bear can be a way forward; and implications for CPG firms. Next, we will discuss these insights in more detail.

4.1. A challenging labor market.

The consensus during our in-depth interviews and the results from our survey are consistent: the labor markets have been rough for grocery retailers. It has been hard to find new workers to staff the basic needs of the stores, stores have been losing employees to other nontraditional labor outlets, and wages have been increasing. These three drivers are not expected to change in the foreseeable future, and for this reason, grocery retailers need to find a long-term approach to stay healthy and profitable.

The P&L of a grocery retailer is simple and can help us make our point clearer. Suppose we assume that the cost of goods sold is 76 percent of the revenue, and the Selling, General, and Administrative (SG&A) expenses correspond to 20 percent of revenues. Therefore, the average operating income of a grocery retailer is approximately 4 percent. It is reasonable to assume that 70 percent of SG&A correspond to the labor cost. Our survey results suggest a potential to increase labor productivity by approximately 16 percent[1]. This is excellent news for retailers in a context where the expectation is that salaries will increase by roughly 20 percent (see the results to our survey). In a context where wages are increasing, and this increase cannot be fully transferred to the customers, the only way to remain profitable is to increase labor productivity.

Most retailers we talked to have a sophisticated approach to establishing the labor needs at their stores based on industrial engineering metrics and careful analyses of their processes. However, it was not uncommon to hear that after the labor needs had been established through these elaborate processes, someone within the CFO's office would cut the labor budget to meet a financial target. This approach is delusional. Only real labor productivity increases can help retailers cut their labor expenses in a way that will not damage their business.

There are a large array of available technologies that have been proven to help with productivity. With the risk of oversimplification, it is fair to say that European retailers are ahead in this game. While US grocery retailers have placed a lot of emphasis on efficiencies in other parts of the business, labor practices and support technology in this area are lagging behind. The wage increase in the US will make many technologies more attractive, and this might help close the gap.

4.2. The online paradox

Almost every retailer sees a strong trend toward different versions of online groceries. For many of these retailers, the rapid growth of online grocery during pandemic times allowed them to test different ways to enable that part of the business. In this transition, there is an underlying tension between customers' trends toward online convenience and retailers' pain to complete those orders. Given the option, grocery retailers would rather fulfill all their orders from the store in the traditional way. This is no surprise since all the retailers' operations have been designed and optimized to take and fulfill orders in the store.

The transition to online grocery has been characterized by a disproportionate effort from retailers to allow customers to place online orders (a much simpler goal) versus fulfilling those orders. The efforts to facilitate placing online orders are paying off with an increase in online orders. However, as online orders are growing, operating margins are being eroded.

While managers expressed that there are opportunities to increase productivity in the online part of the business, the technologies, processes, and investments described in achieving those

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[1] This is the results of the current fractions of hours per task that we obtained on question 3 of the survey and the response to question 4, the productivity improvement that managers think is reasonable to achieve for each task.

improvements are not convincing. This lack of clarity on how to accomplish the desperately needed productivity gains is visible in the large array of solutions that are still out there on how to achieve these improvements. While this variety of potential solutions can be seen as a great source of innovation and creativity, it is more likely a manifestation of the lack of a clear plan.

Grocery retailers might be trapped in a tough spot when it comes to online grocery. To escape from this trap, retailers will need to find that productivity path or decide to share the real cost with the customers willing to pay for the convenience.

4.3. From costs to assets

The last implication of our study comes from the realization that most of the retailers that participated in our survey see their labor more as a cost to be minimized than an asset to be leveraged. Only two of the retailers we interviewed made it clear that their employees in the store were an essential part of their strategy and a building block of their success. For many of these retailers, leadership at the store level and engaged employees were not something to emphasize or an essential part of a successful business.

One factor that can help accelerate changes in this area is the disruption of the gig economy. The gig economy is booming, and it is finding workers from the same pool that retailers traditionally draw from. The companies in the gig economy put pressure on the hourly wages that retailers need to offer and, at the same time, offer flexible schedules that can also be very attractive. With this in mind, it is not surprising that it is challenging to find associates for many retailers.

More grocery retailers need to think carefully about a good job strategy that our colleague Zeynep Ton has advocated for many years. We found a few honorable exceptions in our interviews that evidenced that grocery retailers can thrive while offering meaningful jobs to their employees in the stores. We heard stories of long career paths that started at the store and how a sense of belonging and personal growth can be achieved at every level of the organization.

This change in perspective on the role and potential impact of the store associate seems to us a must-have to achieve meaningful and lasting productivity improvements.

4.4. Implications for the CPG Industry

Currently CPG firms help retailers directly by providing labor through Direct Store Delivery and within store merchandising. While this contribution for sure increases sales of the CPG firm's sales and is doubtless appreciated by the retailers, they did not see this growing in the future or consider it in their labor planning.

There will continue to be an opportunity for CPGs to support retailers to improve productivity with insights and recommendations on how their category can be more productive, take less time to replenish and maintain in-stocks. This could be through assortment and planogram

recommendations. Clearly anything a CPG firm does to enhance the retailers' sales also enhances their sales.

Finally, providing case pack sizes small enough to avoid storing in the back room could be a big booster of productivity and inventory accuracy.

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Appendix

A. Literature review

We review here a selection of publications that are relevant to some of the aspects addressed by this report. We first summarize some publications relevant to many aspects of store operations. We then delve into more depth into six areas: setting staffing levels, shortage of retail workers and rising wages, automation, training, backroom to shelf replenishment, and online fulfillment.

Battaini (2021) presents the results of a June 2021 survey of 253 French, German, Italian and Spanish retailers across grocery, health, and beauty, DIY/hardware, fashion, apparel and footwear, sports goods, furnishing, furniture, electronics, and appliances. The survey results suggest that the retailers believe that stores will be more important in the future, but their role will change, becoming a supply hub to support growing omni-channel operations. The report draws a nice distinction between two roles the store plays – experiential for customers and physical fulfillment. We can think of this as supporting the two elements of a customer's shopping mission – figuring out which product variant to buy and then getting physical access to the product variant.

Questions 3 and 4 ask about the store as the place to experience the product and as a fulfillment hub. Here the answers were 63% for experience and 44% for fulfillment hub.
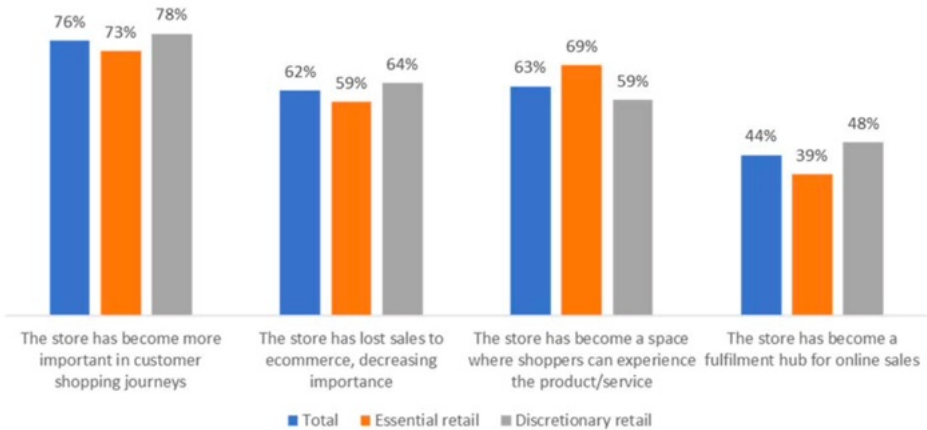
Source: *The Role of Technology in Store Operations Survey*, IDC for Sensormatic Solutions, 2021

Figure A1. How stores have changed due to COVID

Retailers were also doing the things you'd expect to accommodate growing e-commerce: using space for e-commerce fulfillment, fewer smaller stores, and thinking about store location.

If retailers deliver on what they say they are going to do or even are doing in the case of those saying they will expand existing solutions, the store is going to be a very different place soon. Self-checkout, and robots to take inventory to stand out as three technologies getting high scores.

Weinswig (2021) reports findings from a survey of 165 retail and restaurant executives as to their current pain points and level of adoption of workplace technology. She cites a US Bureau of Labor Statistics report showing that the rate of retail workers quitting has grown steadily in the last ten years from 1.5% to 4.7% per quarter. Interestingly, consulting their source[2] we can see that "Overall employment of retail sales workers is projected to show little or no change from 2020 to 2030. Despite limited employment growth, about 557,200 openings for retail sales workers are projected each year, on average, over the decade. Most of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, such as to retire." So the long-term outlook seems like business as usual.

The Weinswig report identifies major retailer concerns and future trends. Major concerns are insufficient staffing and a disconnect with corporate headquarters. Major trends are a need for store associates to have greater product knowledge (so they can keep up with ever well-informed customers) and to support the new role of the store as a support center for omni. Both of these are consistent with what others are saying. The report makes a case for digital applications in stores to support sales associates.

A.1. Setting store staffing levels

Brock and Layok (2016) is a rare publication that points out the need to consider the impact of store associates on revenue in setting staffing levels. They suggest installing traffic counters, using traffic history to forecast future traffic, then estimate the time needed per customer to assist them in the sales process. They cites one example of a retailer that increased staff over the weekend with positive revenue results.

Fisher et al. (2020b) (see also Fisher et al. (2019), University of Pennsylvania Staff Writers (2019)) describes a method for setting the level of staffing for sales associates by using absenteeism as a natural experiment to estimate at the store level the relationship between revenue and staffing level and then choose staffing levels at each store intended to maximize gross margin net of store labor costs. Use of this approach at the retailer they worked with produced a 4.5% revenue increase as measured in a spilt store test.

Fitzpatrick (2020) reports an example of a retailer whose staffing did not match need as reflected in POS sales activity. The urges retailers to track the degree of match between their staffing and need, obtain a staffing software package, and use it effectively.

Calais, et al. (2020) suggests that through activity–based labor scheduling and budgeting, retailers can become more efficient while improving customer service and employee satisfaction.

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[2] https://www.bls.gov/ooh/sales/retail-sales-workers.htm

A.2. Shortage of Retail Workers and Rising Wages

Modi (2022) reports a variety of data, the most interesting being that consumer savings are way up, leading to an August 2021 US Bureau of Labor Statistics report that 4.3 million workers quit, a 2.9% quit rate and **the highest ever reported by the BLS.** One issue for retailers is that being an Uber or Lyft driver appears to be a better job than stocking shelves in a grocery store.

Loeb (2021) discusses that the usual hiring of seasonal workers by retailers for the holiday season will be especially challenging this year because of a scarcity of qualified workers

Kestenbaum (2021) provides an array of statistics related to worker shortages and wages. In April 2021 649,000 retail workers quit, the greatest number in the 20 year history of tracking. This may be due in part to the finding of another survey that 64% of retail workers do not make a living wage. Other than using automation of retail store execution tasks, Kestenbaum was uncertain the solution too retailer worker shortage, but felt retailers needed to strike a balance between is wages so high that they erode profit and so low that they leave the retailer understaffed, which hurts sales.

Megan (2022) reports that Americans are quitting their jobs at a record rate, but hiring substantially exceeds quitting, suggesting that people are leaving to take new, and presumably better, jobs

Nassauer (2022) reports plans of a number of well know retailers, including Target, Costco, Walmart, Amazon, and Home Depot, to significantly increase wages, and notes that rising sales and inflation means that so far this hasn't hurt their profits.

Ritter and Gaffney (2021) believe wage increases alone will not be sufficient to solve worker shortages and suggest a multipronged approach that includes compensation and benefits. flexibility in scheduling, training and personal development, a safe working environment and an inspiring mission and purpose.

A.3. Reducing labor needs through automation

Edge by Ascential (2021) identifies five trends they hypothesize will accelerate in 2022.

1) Checkoutless stores, presumably similar to the Amazon Go store
2) Responsible consumption that's good for the health of consumers and the planet alike
3) Reuse and recycle
4) Stores as fulfillment hubs for e-commerce delivery, BOLPIS, etc.
5) In-store experience is shaped by data-driven, digitally enabled in-store activations and rewards. This includes messages sent to a customer's mobile phone while they're in the store.

Clearly, these are all things that have been in the news and are on retailers' radar screens. They also provide depictions of some fascinating new technologies, shown below, that at first blush seem far-fetched, but if they catch on, they could have a big impact.
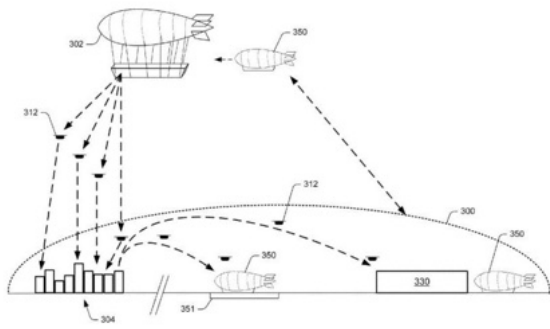
Figure A2. Amazon patent application for a fulfillment center in the sky, with drone delivery

https://www.nuro.ai

Figure A3 Nuro. A last mile solution

Source: CNBC

Figure A4. Nuro in action
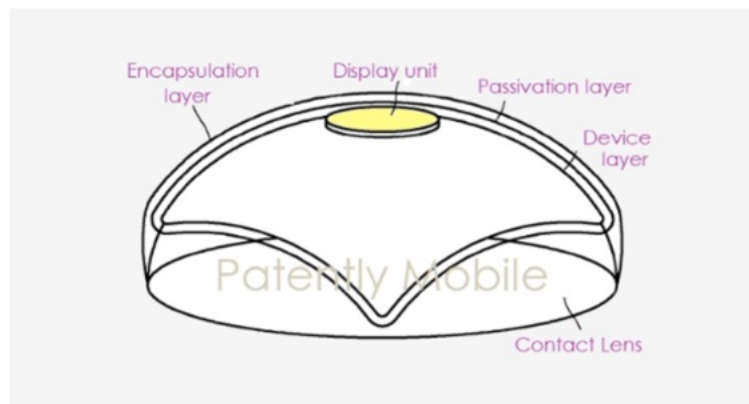
Figure A5. Samsung has secured a patent for an information channel contact lens

Adhi et al. (2020) suggest that brick-and-mortar retailer need to up their game to compete with online and that technology could help them do that. They assess the profit impact of various retail technologies and conclude that smart adoption of within store technology could double a retailer's profit.

The ring scanners being piloted by Walmart Canada (McKay 2022) would be used by online order pickers in stores to scan the items they pick while keeping both hands free, and improvement over the current handheld scanners.

Aryapadi et al. (2020) argues the need for inventory planning software as a way to both improve inventory performance and reduce the labor required for planning. They offer some keys to successful adoption.

A.4. Training

Practis (2021) asserts the more effective stores sales associates will increase close rates. The Practis tool provides product knowledge training for sales associates and equips them to talk well with customers through practice with the tool. Marshall, Gallino, and Netessine (2019, 2020) evaluate a similar tool and provide evidence that sales associates' better training does significantly increase sales.

Fisher et al. (2019, 2020a) reports a collaboration with Dillard's, a leading U.S. department store chain with more than 300 stores to evaluate their use of an online tool to provide product knowledge training to their more than 50,000 sales associates. Increasing a sales associate's knowledge of the products they are selling enables them to better explain product features to customers, thereby assisting them in their choice of product variant to buy. The study found that sales associates who trained on the tool increased their sales rate by a remarkable 26%.

A.5. Backroom to shelf replenishment

Condea et al. 2011 point out the value of case-level RFID. They then propose an algorithm for using POS sales data to identify empty shelf space and initiate periodic backroom-to-shelf replenishment requests.

Hubner and Schaal (2017) used a time and motion study at a German grocery retailer to measure costs and times related to shelf restocking from the backroom. They used the results as input to an algorithm to determine the number of facings and order frequencies to maximize profit subject to limited shelf and backroom capacity. Use of their model increased profit by 29% in the canned foods category.

A.6. Incorporating e-commerce fulfillment into store operations

Aryapadi et al. (2020a) argue that omnichannel shopping will become the new norm for consumers and offer some principals for how to respond to this challenge.

Aryapadi et al. (2020b) suggest that same day delivery is becoming the new standard of customer service. They identify some challenges this creates and how to overcome them.

Howland (2021) reports a survey finding that stores may soon dedicate one third of their space to online fulfillment

Sapna (2021) describes the challenges pickers for online orders in grocery stores face, despite handheld tools intended to guide them on an efficient picking path thru the store.

Renner et al. (2021) reports on a survey of 150 U.S. grocery manufacturer and retailer executives. The key finding was that online is growing and that this will significantly change the nature of work within grocery stores.

Ladd (2020) convincingly asserts that "the worst business model in existence is online grocery ordering and delivery in its current form," because the picking process has no economies of scale and as a result retailers lose up to $25 on every order. This is especially problematic because online has grown from 4.3% to 10.2% of sales during Covid-19. Dark stores designated only for online picking are offered as one possible solution.

Barclays Equity Research (2021) reports of results of a survey of more than 1,000 customers on their views and experience with Instacart. They found that Instacart was the preferred way to shop for 34% of the respondents and that its popularity seems to be steadily growing, as well as the popularity of more recent entrants such as Uber Eats and Walmart delivery.

The report signals concerns that grocery retailers might have about Instacart in that they enthusiastically report greater loyalty by customers to their current grocer than to Instacart. Moreover, if Instacart were not available, some would switch grocers to get Instacart, but many would not simply shop in the store.

A figure from the report both shows the various providers and that most users of each service plan to use it again.

Have you used [Service] more than once in the last 12 months?
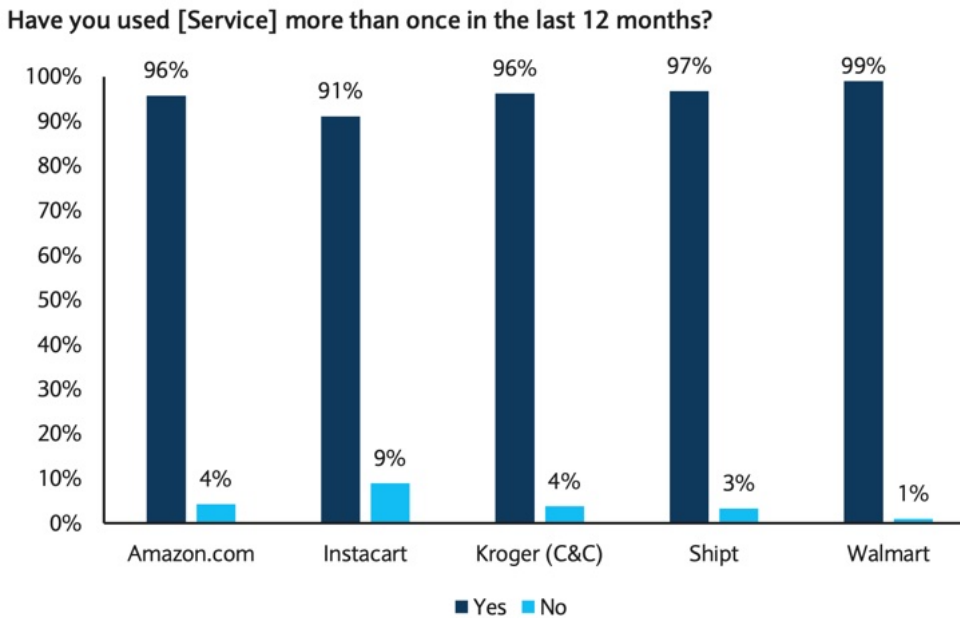
Source: Barclays Research, Numerator.

Figure A6. Most customers plan to use their current delivery service again

B. Interview's Guiding Questionnaire

- How are staffing levels set?
- How often do you cut store labor towards the end of a quarter to 'make your numbers'?
- Level of turnover
- Approximately how are labor hours divided across the following
    - handling freight in and then putting on the shelf,
    - setting up displays,
    - checking the deliveries from the DSD drivers,
    - looking for inventory in the back room,
    - checking gaps on the shelf,
    - checking and changing price tickets,
    - cleaning the section and the floor,
    - cleaning the facilities,
    - putting inventory on the shelf,
    - adding tags,
    - attached hard tags or other security devices,
    - putting cardboard into the dumpster,
    - greeting guests on entrance and exit,
    - providing customer service,
    - counting the cash in the cash room,
    - managing returns at the customer service desk,
    - managing vendor returns for pay on scan,
    - picking online orders
    - other
- What have you done to improve labor productivity?
- What successes have you had implementing within store technology to reduce required labor
- What successes have you had implementing process improvement to reduce required labor
- Training – how much and on what?
- Degree of specialization vs cross training of store labor.
- How to manage e-commerce? E.g. fill at night when no customers, but rate of pay higher, or during the day.
- What is the biggest challenge you face with regards to store labor?
- What else should we know about your approach to management of store labor that we haven't asked?

C. Survey Structure

Q1. Thinking about your current total retail sales, what is your best estimate of today's allocation of sales revenue percent across the following transaction modes (must add up to 100%).

- Customer selects and buys in-store using cashier checkout
- Customer selects and buys in-store using self-checkout
- Customer buys online from our website, we pick from the store, and the customer picks up from the store (click & collect)
- Customer buys online from our website, we pick from the store, and the order is then delivered from the store to the customer's home.
- Customer buys online from our website, we pick from an offsite fulfillment center (FC) and the order is then delivered from the FC to the customer's home
- Customer buys from a third-party website, their pickers pick from our store and then deliver the order to the customer's home

Q2. Thinking about what might happen in the next five years, what is your best estimate of the allocation of sales revenue percent across the following transaction modes in **five years' time**:

- Customer selects and buys in-store using cashier checkout
- Customer selects and buys in-store using self-checkout
- Customer buys online from our website, we pick from the store, and the customer picks up from the store (click & collect)
- Customer buys online from our website, we pick from the store, and the order is then delivered from the store to the customer's home.
- Customer buys online from our website, we pick from an offsite fulfillment center (FC) and the order is then delivered from the FC to the customer's home
- Customer buys from a third-party website, their pickers pick from our store and then deliver the order to the customer's home

Q3. Thinking now about your current allocation of your hourly store associate hours by work process, what is your best estimate on the current percentage of the total labor hours in your stores associated with the following broad work areas:

For this response, please exclude hours corresponding to contractors, vendors, or management-related tasks.

- Receiving and Unloading Freight
- Stocking Shelves
- Facing Shelves
- Customer Checkout
- Ecommerce
- Cleaning
- Other

Q4. With productivity in mind, what percentage improvement in your current hours allocated to each of the work areas do you believe can be achieved in the **next five years**?

For this response, please exclude hours corresponding to contractors, vendors, or management-related tasks.

- Receiving and Unloading Freight
- Stocking Shelves
- Facing Shelves
- Customer Checkout
- Ecommerce
- Cleaning
- Other

Q5. Thinking of the improvements in Question 4. What percentage of the improvement will come from these approaches? The total should add up to 100%.

Process Elimination. Examples could include the moving upstream of products that would normally be stocked via in-store production, such as sandwiches, or the picking of eCommerce orders moved from the store to an offsite fulfillment center

Process Improvement. Examples could include assortment reduction, new online grocery picking techniques, etc.

Process Automation. Examples could include using robots to identify gaps on the shelf, the use of automation to pick eCommerce orders, adoption of self-checkout

Q6. Thinking about new technologies, to what extent do you imagine the following technologies would have been deployed across your business in five years' time?

Select from the following options (Not used at all; In pilot testing; Piloted and discarded; Partially implemented; Partially scaled; Used in all stores):

- Robots to answer customer questions
- Self-checkout fixed station
- Self-checkout (customer uses store supplied device)
- Self-checkout (customer uses their own phone)
- Self-checkout (customer just walks out)
- AI for age verification for cigarettes, alcohol, and other age-restricted products.
- 2D Data bar Codes. Expire date and recalls visibility
- SKU level RFID
- Case level RFID
- Pallet level RFID
- Indoor Geolocation (heatmaps, dwell times, and customers conversion rates)
- Computer vision for theft prevention
- Electronic Shelf Edge Price Labels
- Enhanced and IOT ready In-store WIFI
- Camera to scan shelves for stock-outs
- Robots to scan shelves for stock-outs
- Robots to keep store safe and clean
- Communicating product location via customers' smartphones
- Cart Pusher
- Remote Temperature Monitoring
- WFM systems for scheduling, planning, task management, etc.

Q7. We don't imagine we have created an exhaustive list. Please list any other technology that will impact labor productivity that you think will scale in the next five years:

Q8. How easy or hard is it to find employees for store operations activities today?

- Extremely difficult
- Moderately difficult
- Slightly difficult
- Neither easy nor difficult
- Slightly easy
- Moderately easy
- Extremely easy

Q9. How easy or hard will it be to find employees for store operations activities in **five years**?

- Extremely difficult
- Moderately difficult
- Slightly difficult
- Neither easy nor difficult
- Slightly easy
- Moderately easy
- Extremely easy

Q10. If you think of the hourly wage rates for your full-time store employees in five years. Do you think these will change? By how much?

Q11. If you think about the role of Direct Store Delivery vendors, Broker Representatives, and Merchandisers in the next five years. Do you think their support on labor tasks within the stores will change? By how much?

Q12. How many store locations does your company operate?

Q13. In which country are these stores located?

Q14. How many report levels are between you and your company's CEO?

D. Survey Responses by Group.

Question 1

Q1	US			Non US			Academics		
	Average	Median	Std. Dev.	Average	Median	Std. Dev.	Average	Median	Std. Dev.
In store - Cashier	61.2	56.0	21.3	66.3	67.0	28.4	53.7	50.0	24.5
In store - Self	23.0	24.0	20.7	17.3	16.0	16.1	20.9	19.0	18.9
Online - pick from store customer picks up	4.4	3.0	4.9	3.6	-	8.3	7.0	5.0	6.2
Online - pick from store delivered	7.2	2.0	13.1	8.1	1.0	20.4	8.3	6.0	8.6
Online - fullfillment center delivered	3.8	-	5.3	3.5	0.5	6.2	4.8	3.0	6.0
Third Party - pick from store delivered	0.5	-	1.0	1.1	-	3.5	5.4	2.0	11.2

Question 2

Q2	US			Non US			Academics		
	Average	Median	Std. Dev.	Average	Median	Std. Dev.	Average	Median	Std. Dev.
In store - Cashier	45.4	38.5	25.1	49.0	40.5	26.1	34.3	32.0	25.0
In store - Self	26.4	27.5	21.8	27.1	31.5	19.3	29.5	20.0	25.8
Online - pick from store customer picks up	9.6	6.0	10.2	4.8	3.0	5.6	11.5	6.0	14.5
Online - pick from store delivered	10.1	4.5	15.6	6.3	5.0	9.0	11.3	8.0	11.5
Online - fullfillment center delivered	6.4	5.0	8.2	6.8	5.5	7.6	8.8	6.0	10.1
Third Party - pick from store delivered	2.0	-	4.3	6.0	-	21.3	4.5	5.0	4.3

Question 3

Q3	US			Non US			Academics		
	Average	Median	Std. Dev.	Average	Median	Std. Dev.	Average	Median	Std. Dev.
Receiving and Unloading Freight	14.0	9.5	15.5	18.8	7.5	29.0	18.7	15.0	19.2
Stocking Shelves	24.5	20.5	14.4	26.1	30.0	13.3	23.5	21.0	15.0
Facing Shelves	6.4	7.0	3.8	8.1	5.0	9.0	12.2	7.0	19.2
Customer Checkout	22.7	22.5	15.4	27.4	33.0	12.4	19.1	19.5	11.2
Ecommerce	12.1	9.0	17.3	4.9	5.0	5.4	11.0	10.0	10.5
Cleaning	7.6	8.5	4.2	6.6	5.0	7.8	7.9	6.5	7.2
Other	12.7	4.0	17.5	9.0	5.0	10.2	7.7	5.0	11.2

Question 4

Q4	US			Non US			Academics		
	Average	Median	Std. Dev.	Average	Median	Std. Dev.	Average	Median	Std. Dev.
Receiving and Unloading Freight	11.6	10.0	11.1	16.9	9.0	23.5	17.1	10.5	19.6
Stocking Shelves	18.2	10.0	19.8	25.7	22.5	21.9	18.3	15.0	18.5
Facing Shelves	9.1	5.0	12.5	6.8	2.0	9.3	13.7	8.5	20.7
Customer Checkout	20.7	20.0	14.9	23.2	24.5	14.7	26.0	15.0	24.6
Ecommerce	20.6	15.0	21.8	11.6	10.5	12.7	25.2	20.0	22.3
Cleaning	6.8	5.0	10.1	10.6	5.0	18.5	10.3	5.0	17.0
Other	11.4	3.0	22.3	6.4	2.5	7.6	7.3	-	11.7

Question 5

Q5	US			Non US			Academics		
	Average	Median	Std. Dev.	Average	Median	Std. Dev.	Average	Median	Std. Dev.
Process Elimination	27.7	25.0	19.9	25.5	23.0	21.3	28.4	25.0	20.3
Process Improvement	39.2	40.0	15.6	41.2	34.5	22.8	31.3	29.0	22.7
Process Automation	33.1	30.0	21.6	33.3	37.0	21.4	40.2	40.0	23.1

Question 6

US	Not used	In pilot	Discarded	Implemented	Scaled	Used
Robots to answer customer questions	40.0	20.0	13.3	6.7	6.7	13.3
Self-checkout fixed station	6.7	20.0	6.7	6.7	-	60.0
Self-checkout (customer uses store supplied device)	26.7	20.0	13.3	20.0	13.3	6.7
Self-checkout (customer uses their own phone)	20.0	20.0	6.7	20.0	6.7	26.7
Self-checkout (customer just walks out)	40.0	40.0	-	6.7	13.3	-
AI for age verification for age-restricted products	73.3	13.3	-	13.3	-	-
2D Data bar Codes. Expire date and recalls visibility	14.3	42.9	-	28.6	7.1	7.1
SKU level RFID	33.3	33.3	6.7	13.3	6.7	6.7
Case level RFID	40.0	26.7	6.7	20.0	-	6.7
Pallet level RFID	33.3	33.3	6.7	26.7	-	-
Indoor Geolocation	13.3	26.7	-	33.3	20.0	6.7
Computer vision for theft prevention	-	33.3	6.7	20.0	13.3	26.7
Electronic Shelf Edge Price Labels	7.7	23.1	23.1	23.1	15.4	7.7
Enhanced and IOT ready In-store WIFI	30.8	15.4	-	30.8	7.7	15.4
Camera to scan shelves for stock-outs	30.8	23.1	7.7	30.8	-	7.7
Robots to scan shelves for stock-outs	30.8	23.1	23.1	15.4	-	7.7
Robots to keep store safe and clean	30.8	30.8	7.7	23.1	-	7.7
Communicating product location via customers' smartphones	15.4	30.8	-	23.1	7.7	23.1
Cart Pusher	53.8	7.7	-	7.7	15.4	15.4
Remote Temperature Monitoring	15.4	-	7.7	7.7	7.7	61.5
WFM systems for scheduling, planning, task management, etc.	-	-	-	46.2	7.7	46.2
Average	26.5	23.0	6.5	20.1	7.1	16.8
Std. Dev.	17.5	11.2	6.9	10.2	6.1	17.8

Non US	Not used	In pilot	Discarded	Implemented	Scaled	Used
Robots tanswer customer questions	44.4	11.1	-	11.1	22.2	11.1
Self-checkout fixed station	11.1	5.6	5.6	-	33.3	44.4
Self-checkout (customer uses store supplied device)	16.7	11.1	11.1	11.1	27.8	22.2
Self-checkout (customer uses their own phone)	16.7	11.1	-	16.7	16.7	38.9
Self-checkout (customer just walks out)	38.9	22.2	11.1	11.1	5.6	11.1
AI for age verification for cigarettes, alcohol, and other age-rest	50.0	16.7	-	16.7	-	16.7
2D Data bar Codes. Expire date and recalls visibility	27.8	11.1	-	11.1	16.7	33.3
SKU level RFID	55.6	-	5.6	-	11.1	27.8
Case level RFID	33.3	16.7	5.6	5.6	16.7	22.2
Pallet level RFID	16.7	11.1	5.6	16.7	16.7	33.3
Indoor Geolocation	16.7	38.9	11.1	16.7	-	16.7
Computer vision for theft prevention	33.3	22.2	5.6	5.6	16.7	16.7
Electronic Shelf Edge Price Labels	12.5	6.3	-	31.3	37.5	12.5
Enhanced and IOT ready In-store WIFI	-	31.3	12.5	18.8	12.5	25.0
Camera tscan shelves for stock-outs	25.0	31.3	12.5	18.8	6.3	6.3
Robots tscan shelves for stock-outs	56.3	6.3	12.5	18.8	-	6.3
Robots tkeep store safe and clean	37.5	37.5	-	18.8	-	6.3
Communicating product location via customers' smartphones	18.8	31.3	6.3	31.3	-	12.5
Cart Pusher	68.8	12.5	6.3	6.3	-	6.3
Remote Temperature Monitoring	18.8	12.5	6.3	18.8	-	43.8
WFM systems for scheduling, planning, task management, etc.	6.3	6.3	18.8	6.3	6.3	56.3
Average	28.8	16.8	6.5	13.9	11.7	22.4
Std. Dev.	17.9	11.0	5.3	8.2	11.3	14.2

Academics	Not used	In pilot	Discarded	Implemented	Scaled	Used
Robots tanswer customer questions	8.7	30.4	26.1	30.4	4.3	-
Self-checkout fixed station	-	-	-	21.7	30.4	47.8
Self-checkout (customer uses store supplied device)	-	13.0	13.0	30.4	26.1	17.4
Self-checkout (customer uses their own phone)	-	13.0	-	65.2	13.0	8.7
Self-checkout (customer just walks out)	8.7	43.5	4.3	34.8	8.7	-
AI for age verification for cigarettes, alcohol, and other age-rest	26.1	43.5	4.3	8.7	13.0	4.3
2D Data bar Codes. Expire date and recalls visibility	9.1	22.7	4.5	45.5	-	18.2
SKU level RFID	18.2	27.3	9.1	9.1	31.8	4.5
Case level RFID	4.5	13.6	4.5	40.9	22.7	13.6
Pallet level RFID	4.5	13.6	4.5	27.3	22.7	27.3
Indoor Geolocation	-	22.7	4.5	40.9	27.3	4.5
Computer vision for theft prevention	4.5	31.8	-	31.8	27.3	4.5
Electronic Shelf Edge Price Labels	-	19.0	4.8	42.9	14.3	19.0
Enhanced and IOT ready In-store WIFI	-	19.0	-	47.6	9.5	23.8
Camera tscan shelves for stock-outs	-	19.0	4.8	47.6	19.0	9.5
Robots tscan shelves for stock-outs	4.8	19.0	33.3	38.1	4.8	-
Robots tkeep store safe and clean	9.5	28.6	19.0	28.6	14.3	-
Communicating product location via customers' smartphones	4.8	19.0	9.5	38.1	19.0	9.5
Cart Pusher	19.0	28.6	4.8	23.8	4.8	19.0
Remote Temperature Monitoring	9.5	19.0	4.8	14.3	19.0	33.3
WFM systems for scheduling, planning, task management, etc.	-	9.5	4.8	14.3	23.8	47.6
Average	6.3	21.7	7.7	32.5	17.0	14.9
Std. Dev.	7.1	10.2	8.5	13.9	9.1	14.1

Question 8 & 9

US
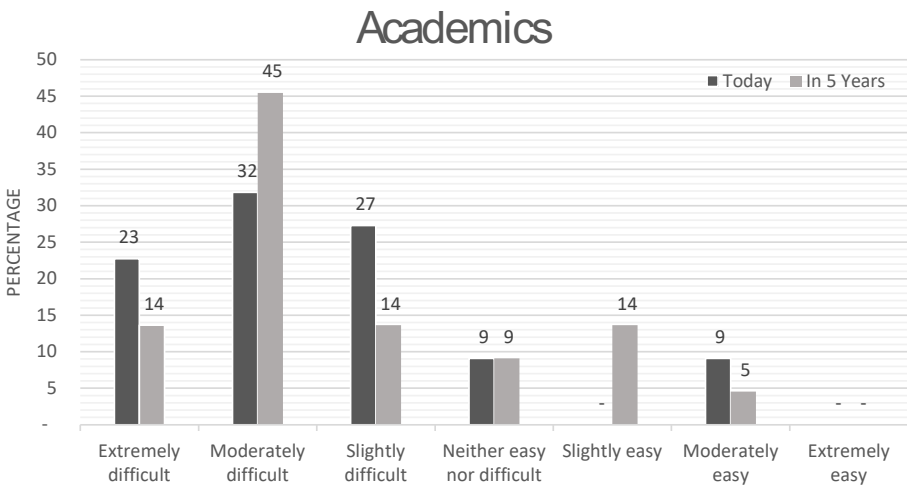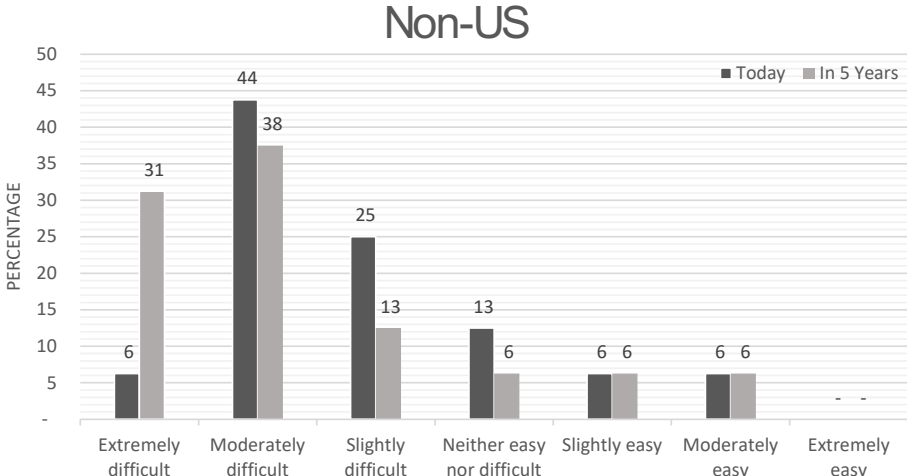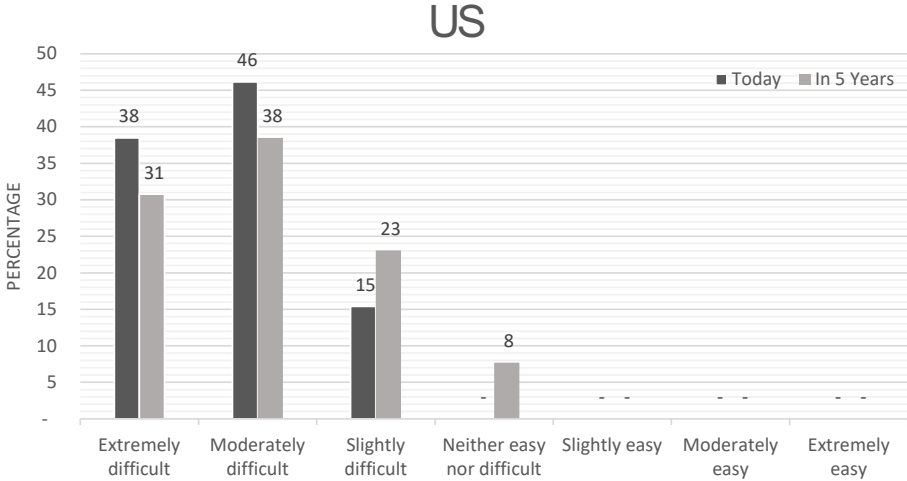
Non-US

Academics

Question 10 & 11

Q10 & Q11	US			Non US			Academics		
	Average	Median	Std. Dev.	Average	Median	Std. Dev.	Average	Median	Std. Dev.
Salary Change	21.6	20.0	7.0	29.3	22.5	23.3	20.4	20.0	14.7
Direct Store Delivery Vendors	9.8	10.0	20.3	(5.2)	-	49.3	15.4	19.5	18.1
Broker Representatives	(5.0)	0.5	36.5	(21.4)	(9.0)	57.5	(3.2)	(10.0)	25.1
Merchandisers	1.5	-	20.9	0.5	(0.5)	43.5	1.1	10.0	29.8