Retail-hardened POS systems solve hardware challenges to ensure retailers meet their goals.

BIG VILLAGE

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Introduction

Retailers aim to leverage technology now and, in the future, to improve customer experience. Technology can come with a range of challenges that make it difficult for retailers to meet their goals. Retail hardening is a solution to these challenges. Retail-hardened systems are true point-of-sale systems engineered to deliver high uptime and long-term reliability. In a series of technical tests, Toshiba Global Commerce Solutions' TCx 810 point-of-sale (POS) device was shown to be superior to competing brands' POS models.

Retailers Aim to Enhance Customer Experience with Technology

A survey of retailers uncovered retailers' goals to enhance the checkout experience using technology. In this whitepaper, we'll discuss the ways POS technology challenges threaten these goals, as well as the way Toshiba's retail-hardened POS solution solves those challenges via reliability, durability, accuracy, flexibility, and serviceability.

Retailer Goals to Enhance the Checkout Experience Related to Technology

Retail decision-makers view technology as an enabler of **customer experience.** Improved experience, attracting new customers, and increasing loyalty are the top goals for enhancing the checkout experience. Also important are **increasing sales, decreasing costs, and speeding up transactions.** Reducing IT complexity, differentiating the brand, and increasing hardware lifespan are less important.

A Range of Technology Challenges Can Threaten Retailer Goals

There are a number of potential challenges that come with technology that may hinder retailers from reaching their goals. When asked what their biggest challenges or pain points with their POS systems are, retailers mentioned speed and downtime most commonly. Solving these challenges will improve the customer experience and meet the goals shared by about 30% of retailers to decrease average transaction time and increase hardware lifespan.

Key challenges that relate to POS hardware are:

- Set up is difficult/time-consuming
- Poor aesthetics
- POS units are inoperable
- Technology is hard-to-use/inaccurate touchscreen
- Maintenance is difficult/time-consuming

Technology challenges impact speed which in turn impacts customer experiences and costs.

Retailers want to be assured that their POS systems will function 24/7/365. Slow processing speeds, inaccurate touchscreens, item lookup errors, and down systems mean each transaction takes longer. Longer transaction times cause longer wait times. POS units that are inoperable mean fewer lanes are open, which also increases wait times.

We "need them to be fast and efficient. They are efficient, but speed varies."

– Specialty store

The biggest pain point "has to be down time... [which is] rare but very disrupting."

– Departmental store

"Durability [in a] hostile environment, at least in one of the branches," is the biggest pain point.

– Retailer

"If the technology fails, there is hardly any way to remedy the situation without professional help and all sales processes are interrupted."

– Supermarket

These impacts on time ultimately impact **sales and costs.**

- More time spent checking out negatively impacts **customer experience** and perception of the retailer, leading to **decreased sales.**
- Longer transaction times mean a larger number of checkout staff are needed to handle the same number of checkouts, leading to **increased costs.**
- The stress of long wait times negatively impacts employee experience, leading to turnover and **increased costs.**

Additionally, **decreasing transaction times** is a goal in and of itself.

"They need maintenance too often."

– Service Retailing

"When it breaks down it can take awhile... [for] customer service to get us back up."

– Service Retailing

"Oftentimes we have issues with integration and also support features."

– Convenience store

The "system not recognizing an action" is the biggest pain point.

– Supermarket

Technology challenges impact experiences which in turn impact sales and costs.

Since enhanced **customer experience** is a key goal, challenges that impact customer experience are particularly important, especially since poor customer experience can lead to **decreased sales.** Specifically:

- Hard-to-use or inaccurate touchscreens can make consumers frustrated and annoyed.
- Poor aesthetics can make the customer experience unpleasant.

Furthermore, these factors can also negatively impact the employee experience, leading to higher turnover and **higher costs.**

Technology challenges directly impact costs in the form of IT staff time.

Difficult and time-consuming setup and maintenance require more IT staff time. Additionally, inoperable POS units take IT time to rectify.

- More internal or 3rd party IT time contributes to **higher costs.**

Technology Challenges Have Solutions

As discussed above, the technology challenges identified can hinder retailers from meeting their goals. However, all these technology challenges have solutions. Understanding some of the key causes of the challenges points to solutions.

There are some trade-offs to be made.

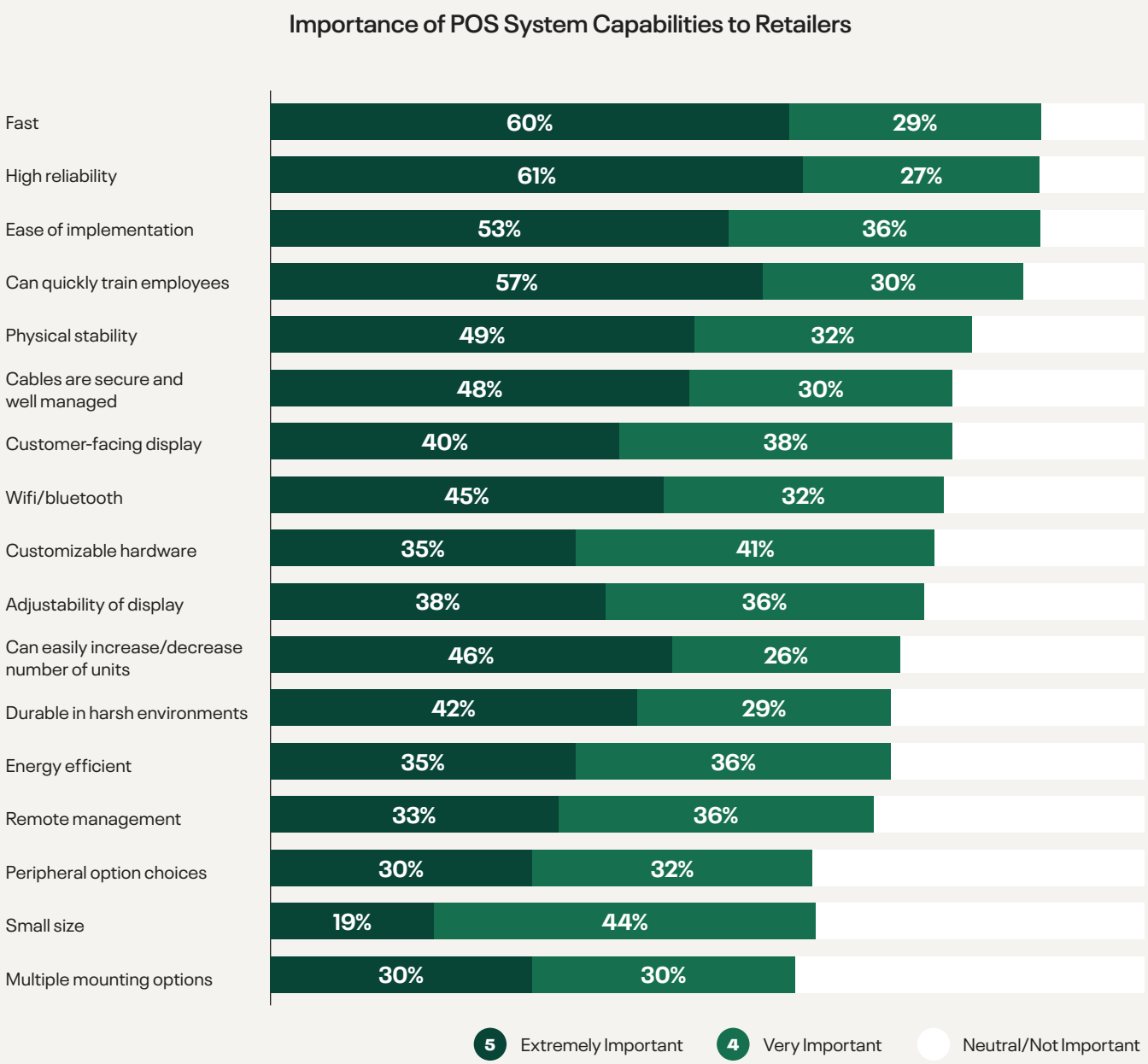
- Well-managed cables are less likely to be disconnected or damaged and they provide better aesthetics. However, this means more time is required to set up the POS units, which is a cost. Nevertheless, the incremental cost associated with more time-consuming setup is less than the cost of troubleshooting disconnected cables and replacing damaged cables.
- The hardware solutions outlined come at a cost in the form of a higher initial purchase price. However, thoughtful deliberate design ensures that the total cost ownership will be less, due to increased lifespan, decreased maintenance, and fewer service calls. Furthermore, the positive impact on customer and employee experience will indirectly increase sales and decrease staff costs.

TECHNOLOGY CHALLENGE	SET UP IS DIFFICULT/TIME-CONSUMING	POOR AESTHETICS	POS UNITS ARE INOPERABLE	TECHNOLOGY IS HARD-TO-USE/ INACCURATE TOUCHSCREEN	MAINTENANCE IS DIFFICULT/ TIME-CONSUMING
HARDWARE CAUSES	Hard to understand the installation process of cabling, extra cable security	No or poor cable management system to cover and organize cables which can lead to a messy cash wrap area	Temperature extremes, electrostatic discharge (ESD), dust/lint, liquid spills, cable disconnected/ damaged	Inaccurate touchscreen	Hard to access unit for maintenance, memory upgrades, and storage
HARDWARE SOLUTIONS	Easy to understand cabling, no / less cable security	Thoughtful cable management approach and better customer perception	Retail hardened design	Accurate touchscreen	Easy to access unit for maintenance, memory upgrades, and storage

Retailers Recognize the Value of These Solutions

Retailer survey data highlight reliability and speed as extremely important POS system capabilities. These capabilities address some of the key challenges that threaten retailers' ability to meet their goals.

- Reliability means the POS units remain operable. Retailers want durable systems with 100% uptime.
- Speed means transaction times are as fast as possible. As discussed above, these factors impact retailers' goals.



Toshiba's TCx® 810 Incorporates Key Solutions

Toshiba designed its TCx® 810 POS to provide the solutions to key challenges discussed above. In a survey of retailers, the TCx® 810 POS's differentiation and value were described as follows. Neither the Toshiba brand name nor the TCx® 810 product name were mentioned.

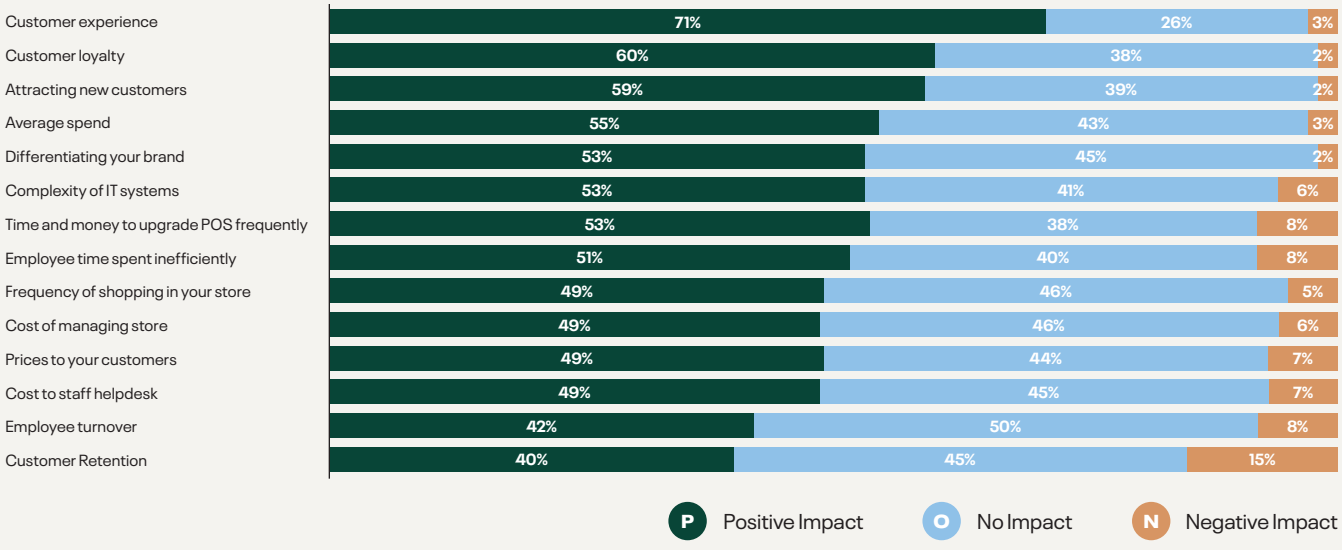
Point-of-sale technology performance, flexibility, and low total cost of ownership are vital for retailers who need support for their current store operations and want to prepare for the future as their business evolves. This All-in-One POS System delivers the next generation of a POS family that retailers globally trust to support their infrastructure. A robust all-in-one point-of-sale system, the product drives today's smarter store solutions through innovation that delivers maximum performance, high availability, easy serviceability, energy efficiency and adaptability.

Key Benefits:

- *Versatility to use one system for multiple purposes throughout the store*
- *Customizable with a full line of configuration options, peripherals, and maintenance support*
- *Rigorously tested to ensure the highest performance, durability, and reliability for any retail environment*
- *Compatibility with existing technology minimizes cost and simplifies future upgrades*

In the survey, retail POS users had a positive reaction to the unbranded TCx® 810 concept and feel that it would have a positive impact on their establishment. The greatest impact is expected on retail customers: their experience, their loyalty, and the ability to attract new customers, all of which line up with retailers' top goals.

TCx® 810 Impact on Retailers



Survey respondents identified numerous benefits of the Toshiba TCx® 810. Speed, ease of use, cost savings, reduced downtime, and reliability were the most commonly mentioned benefits.

In addition to the features and benefits mentioned in the survey description above, the TCx® 810 POS:

- Uses an operating system that boots up quickly and is reliable.
- Has an accurate touchscreen and fast processor which improves transactional speeds, drives accuracy, decreases errors, and speeds up checkouts.
- Features better cable management with the flexibility of more I/O ports and with no connectivity issues.
- Is retail-hardened for increased uptime and lifespan.

Furthermore, Toshiba offers wall-to-wall service, which makes IT systems less complex to manage.

Toshiba's TCx® 810 Outperforms the Competition

The Toshiba TCx 810 solves the technical challenges that threaten retailers' goals of improving the customer experience, increasing sales, and decreasing costs. Furthermore, it solves these challenges more effectively than other POS units.

"The more inclusive and streamlined the system is, the easier to train people to use, and the faster the checkout process will be, improving the customer experience, and in the case of a busy pop up, serving more customers in a shorter amount of time, minimizing lost customers if people get impatient waiting to be rung up."

– Specialty store

"The most important thing is to lower the administration costs for the use of the equipment. More accessible hardware to view account movements in real time for both customers and merchants. Increase the reliability of the brand and offer a better service to the user. Greater durability of the battery of the units. Larger screen and double screen."

– Specialty store

An independent, technical expert assessed the TCx 810 and the following other POS units:

- Diebold Nixdorf: Beetle A1150
- Hewlett Packard (HP): Engage One Pro
- NCR: CX7
- ELO: EPS15E2

These POS units most directly compete with the TCx 810.

The suite of defined technical and operational requirements the expert assessed comprises:

- Cable management
- Temperature and humidity environmental performance
- Electrostatic discharge immunity
- Dust and lint immunity
- Liquid spill resistance
- Touchscreen navigation
- Data storage and memory management
- Services support

For each assessment, the expert summarized the findings with a rating. These expert assessments relate to the technical challenges that threaten retailers' goals as shown in the table below.

TECHNOLOGY CHALLENGE	SET UP IS DIFFICULT/TIME-CONSUMING	POOR AESTHETICS	POS UNITS ARE INOPERABLE	TECHNOLOGY IS HARD-TO-USE/ INACCURATE TOUCHSCREEN	MAINTENANCE IS DIFFICULT/ TIME-CONSUMING
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ASSESSMENT APPROACH	Independent expert assessment of cable management	Independent expert assessment of cable management	Independent expert assessment of cable management Independent expert analysis of temperature, ESD, dust/lint, and spill tests conducted by Toshiba.	Independent expert analysis of touch tests conducted by Toshiba.	Independent expert assessment of the process required to replace storage and memory, as well as of services support available.

P Positive Rating A Average Rating N Negative Rating

Cable Management

Cable management is critically important to the effective operation of a POS terminal device. Since most POS devices sit on a counter or tabletop, the cable housings, connection jacks, and connection ports are subject to exposure to food liquids, chemicals, and general solid debris that can negatively impact communications and device performance.

The independent expert set up the cabling on each POS device and observed the advantages and disadvantages of each cable management approach. The cable connections for the NCR, HP, and ELO POS devices are designed to lay flat on a countertop, so they expose the terminal connectors and ports to potential damage from liquid spills and solid debris. The Diebold Nixdorf and the Toshiba POS devices provide liquid spill and solid debris protection. Furthermore, the Toshiba device has cable covers that provide maximum protection against liquid spills and solid debris. Additionally, the Toshiba device is the only terminal with a screw-locked metal panel that mitigates the risk of accidentally dislodging the cables via undue stress on the cables.

EXPERT ASSESSMENT	**DIEBOLD NIXDORF** BEETLE A1150	**HEWLETT PACKARD** ENGAGE ONE PRO	**NCR** CX7	**ELO** EPS15E2	**TOSHIBA** TCX® 810
CABLE MANAGEMENT	P	A	A	A	P
TEMPERATURE AND HUMIDITY	P	P	P	P	P

Temperature and Humidity Environmental Performance

POS devices need to reliably operate in a wide variety of temperatures and humidities. Environmental testing was performed by utilizing the Thermal Cycle Stress Test Protocol. This protocol measures each POS device's ability to tolerate changes in temperature and humidity over long durations of time. During the test process, each POS device was subjected to significant temperature and humidity changes (0 °C to 45 °C and 38% to 80% humidity) and required to dwell at the temperature extremes for several hours. The primary test measurements were the temperature of the CPU and SSD drives. Once the testing was completed, each device was powered on to determine whether the device operated properly.

All POS devices tested satisfied the test requirements and operated properly after the completion of the test process. The Toshiba, NCR, and HP devices all include a variable-speed fan

to mitigate temperature impacts. The Diebold Nixdorf and ELO devices do not include a fan. The Diebold Nixdorf POS experienced some thermal throttling, and the SSD experienced some performance irregularities, but the device overall performed at manageable levels.

Electrostatic Discharge Immunity

An unexpected electrostatic discharge (ESD) creates a current that can severely damage electrical equipment. ESD testing, based on the IEC 61000-4-2 standard, was conducted to determine the level of damage protection engineered into each of the POS devices.

Air-based and direct-based transfer tests were conducted at a set of key device contact points. When the tests were completed, each device was powered on and functionally tested, using a USB mouse to determine whether the device was operating properly.

With the exception of the HP Engage One Pro, all of the POS devices effectively passed the ESD testing procedures.

- The HP Engage One Pro experienced unrecoverable USB port lockups due to contact made with the rear panel, front panel, and power button area. When the ESD test was completed, the computer mouse failed to operate properly.
- Unlike the other devices, the USB and I/O connector ports on the NCR POS were not accessible for an ESD test, and so were not included in the test. However, this inaccessibility means an end-user failure is highly unlikely.
- Unlike the other devices, a scanner was attached to the Toshiba TCx 810 during the test. The scanner did not degrade the ESD immunity of the device. The TCx 810 is designed to mitigate ESD impacts from connected peripherals.

EXPERT ASSESSMENT	**DIEBOLD NIXDORF** BEETLE A1150	**HEWLETT PACKARD** ENGAGE ONE PRO	**NCR** CX7	**ELO** EPS15E2	**TOSHIBA** TCX® 810
ELECTROSTATIC DISCHARGE	P	N	P	P	P
DUST AND LINT	P	P	P	P	P

Dust and Lint Immunity

POS devices are often required to operate in dirty environments. The POS testing conducted was based on the ASHRAE standard, paying particular attention to dust and lint clogging the device's fan and air vents which could negatively impact the performance of the device's CPU and SSD.

The POS devices were placed in a chamber into which dust and lint were dispensed. The temperature of the CPU and SSD were measured.

To pass the test the temperatures could not change more than 5 °C, accumulation of dust and lint on the device's fan or air vents could not significantly impede airflow, and the device must operate properly after test completion.

All the POS devices passed the required standards for dust and lint Immunity.

Liquid Spill Resistance

In the retail environment, POS devices are subject to a wide variety of common accidental exposures to liquid spills and drips. A spilled cup or leaking pipe can destroy a POS device.

IEC standards for moisture exposure were used as a reference for the test process. The device was powered off and 32 ounces of dyed water was poured over it. After two hours the device was wiped dry and opened to determine it liquid seeped in critical components. It was then powered on and a complete systems check was performed.

The NCR, ELO, and HP devices are not designed for exposure to liquid spills, according to manufacturer documentation, so were not subjected to the test. Only the Diebold Nixdorf Beetle A1150 and the Toshiba TCx 810 were tested. The Beetle A1150 has an IEC Ingress Protection rating of IP54, which means it is protected against splashes. The TCx 810 has an IP53 rating, which means it is protected against a heavy liquid spray. Although both passed the spill test, the Toshiba TCx 810 is engineered to a more stringent standard, making it a better functional fit for retail environments where the risk of water or liquid beverage exposure is high.

EXPERT ASSESSMENT	**DIEBOLD NIXDORF** BEETLE A1150	**HEWLETT PACKARD** ENGAGE ONE PRO	**NCR** CX7	**ELO** EPS15E2	**TOSHIBA** TCX® 810
LIQUID SPILLS	P	N	N	N	P

Touchscreen Navigation

Effective touchscreen navigation is essential to the productive operation of any POS device. Retailers must have confidence their POS terminal can keep pace with their data entry workflow with precision.

For touchscreen testing, Toshiba uses a proprietary test bed comprising software and a robotic arm that controls a contact stylus. The test consists of thousands of taps, multi-taps, and drags of the stylus on the touchscreen.

The software logs errors in:

- Recognition of contact between the stylus and the screen,
- Recognition of loss of contact between the stylus and the screen, and
- The location of the stylus on the screen.

The maximum number of errors of each type, within a set tolerance are pre-defined.

There were significant differences in performance among the POS devices tested.

- The Toshiba TCx 810 performed best against all error types. It was designed to meet the test requirements.
- The HP Engage One Pro met the requirements but performed on the margin of standard acceptability for some error types.
- The NCR CX7 met the requirements for some error types but failed to satisfy the requirements for multi-taps.
- The ELO and Diebold Nixdorf devices did not meet the requirements due to multiple types of errors.

Data Storage and Memory Management

New applications are constantly released in the retail industry. To take full advantage of their capabilities and maintain performance, memory and storage upgrades may be required. Upgrades may involve hundreds and possibly several thousands of POS devices. Therefore, POS devices must be efficiently designed to minimize the downtime and labor costs of upgrades.

All five of the devices require the removal of back panels to have access to the SSD and memory components. The HP Engage One Pro requires an additional step of removing the computer hub from the terminal display. Except for the TCx 810, all the devices needed to be positioned screen-side-down to perform the upgrades. This may lead to scratches or other screen damage. The TCx 810's dual hinge allows the upgrades to be performed with the hinge in the compressed position with the device itself remaining in the upright, operational position. Additionally, the TCx 810 housing includes a bezel that ensures the screen is elevated if the device is placed screen-side-down.

EXPERT ASSESSMENT	**DIEBOLD NIXDORF** BEETLE A1150	**HEWLETT PACKARD** ENGAGE ONE PRO	**NCR** CX7	**ELO** EPS15E2	**TOSHIBA** TCX® 810
TOUCH SCREEN NAVIGATION	N	A	N	N	P
STORAGE AND MEMORY	A	A	A	A	P

Services Support

Retailers' in-store technology portfolios usually consist of multi-vendor, legacy devices and systems that cannot automatically or conveniently be sunset simply because they are older technology. In many cases, the expected ROI on these asset investments is still pending and retailers will utilize these assets until financial and operational expectations are met.

The success of POS devices depends not only on each device's feature set, but equally on how adroitly the vendor plans, tests, and manages implementation, integration, and long-term. Every POS vendor promotes support services as a core competency. However, the depth and breadth of the services vary greatly by vendor.

- Toshiba, HP, and NCR provide a full complement of services globally. Diebold Nixdorf has a very limited reach beyond Europe. ELO does not provide a full complement of services.
- Toshiba, HP, and NCR offer on-site services primarily via employee field technicians and corporate-owned regional parts and logistics support centers. Diebold Nixdorf and ELO must rely on third parties as primary providers.
- Toshiba, HP, and NCR use proprietary POS management software that proactively monitors and manages the performance, configuration, and administration of POS assets. Diebold Nixdorf's support platform comprises disparate products bolted onto its helpdesk. ELO's ELOCare is a do-it-yourself replacement model with limited on-site support.
- Only Toshiba offers a comprehensive, multi-POS-vendor support model as a strategic component of its service offerings. HP and NCR will also contract for third-party POS system support, but this type of service is considered a necessity for securing support contracts as opposed to a core competency. Multi-vendor support is not a stated core competency of Diebold Nixdorf or ELO.

Only Toshiba, HP, and NCR have the resource depth and geographic reach retailers need. Toshiba is the only vendor that supports a multi-vendor environment as a core competency. Retailers who require a full suite of support services, a multi-vendor coexistence environment for the long term, and a ruggedized, full-feature POS would be best served by adding the Toshiba TCx 810 to their POS portfolio.

EXPERT ASSESSMENT	**DIEBOLD NIXDORF** BEETLE A1150	**HEWLETT PACKARD** ENGAGE ONE PRO	**NCR** CX7	**ELO** EPS15E2	**TOSHIBA** TCX® 810
SERVICES SUPPORT	A	P	P	N	P

Conclusion

Of all the industry-leading devices tested in this assessment, only the Toshiba TCx 810 consistently performed well against operational and customer support requirements. Based on the testing results, the TCx 810 has proven to be an excellent choice for enterprise retail customers who require a POS device that is:

- Easy to install,
- Easy to maintain and upgrade,
- Ruggedized for reliability in a wide variety of operating environments, and
- Supported by world-class global resource infrastructure.

The Toshiba TCx® 810's retail-hardened design leads to a lower total cost of ownership by solving the challenges retailers face, helping them reach their goals.

To learn more about the TCx® 810 POS visit TCx® 810 POS System | Toshiba Commerce.

EXPERT ASSESSMENT	DIEBOLD NIXDORF BEETLE A1150	HEWLETT PACKARD ENGAGE ONE PRO	NCR CX7	ELO EPS15E2	TOSHIBA TCX® 810
CABLE MANAGEMENT	P	A	A	A	P
TEMPERATURE AND HUMIDITY	P	P	P	P	P
ELECTROSTATIC DISCHARGE	P	N	P	P	P
DUST AND LINT	P	P	P	P	P
LIQUID SPILLS	P	N	N	N	P
TOUCH SCREEN NAVIGATION	N	A	N	N	P
STORAGE AND MEMORY	A	A	A	A	P
SERVICES SUPPORT	A	P	P	N	P

P Positive Rating A Average Rating N Negative Rating

Disclaimer

The product test findings contained herein are based on the results of pre-defined test script activities performed on all the POS devices referenced in this document. The product test findings are not to be construed as third-party, independent certification of any kind and/or an evaluation of fit for use of any of the products for any specific business environment or purpose. Repeating the performance of these test activities by the Toshiba test team or an independent third party is not a guarantee that the test findings will yield the same or similar results.

About the Project Participants

Toshiba Global Commerce Solutions empowers retail to thrive and prosper through a dynamic ecosystem of smarter, more agile solutions and services that enable retailers to resiliently evolve with generations of consumers and adapt to market conditions. Supported by a global organization of devoted employees and partners, retailers gain more visibility and control over operations while enjoying the flexibility to build, scale, and transform retail experiences that anticipate and fulfill consumers' ever-changing needs. Visit commerce.toshiba.com and engage with us on X, formerly known as Twitter, Facebook, LinkedIn, Instagram, and YouTube, to learn more.

Big Village is a global marketing and media company. Driven by its diverse group of experts, Big Village provides a new way of working by bringing media, insights, and creative all under one roof. Big Village is headquartered in Princeton, New Jersey with offices across North America. Find out more at https://big-village.com/.

Sy Inwentarz, a member of Big Village's expert network, is a senior IT consulting practice executive and CIO. He has 25 years of experience in the development and deployment of full life-cycle IT services. This includes on-site consulting, transition management, practice management, product technology/service creation, IT application development, infrastructure management, partner channels, and global outsourcing.

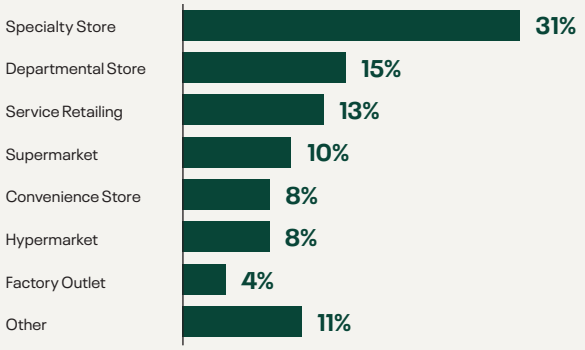
Methodology

Retailers Survey. Big Village fielded a quantitative online survey among n=146 retailers in the US, Germany, and Mexico. The survey respondents were involved in selecting POS technology for their organization or provided input to the decision-makers. The survey was fielded February 22 to March 8, 2022. The profile of the survey respondents and their current use of POS systems is illustrated at right. Respondent companies have a median of seven POS units currently in use.

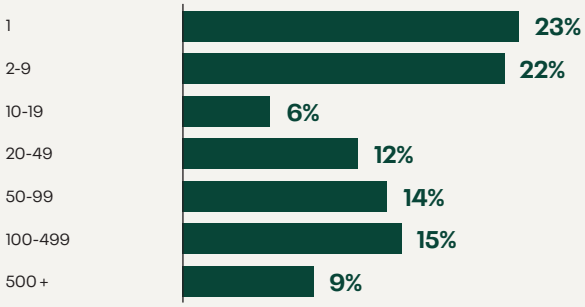
Technical Assessment. The primary purpose of this assessment effort, conducted by Sy Inwentarz, was to compare and contrast the aforementioned competitive devices against the TCx 810, using predefined technical and operational requirements. Guidelines and assumptions for this assessment were defined as follows:

- The goal was to evaluate how the POS devices are positioned to support enterprise-level retailers.
- Functionality and performance were measured from both the general consumer and the company employee perspective.
- Documented industry standards, general industry guidelines, and formal Toshiba testing standards were used in this assessment. Toshiba standards are usually directly aligned with industry standards and guidelines.
- Every effort was made to maintain objectivity and uniformity in the evaluation of the POS devices included in this assessment. None of the tests was designed to favor one vendor over another.

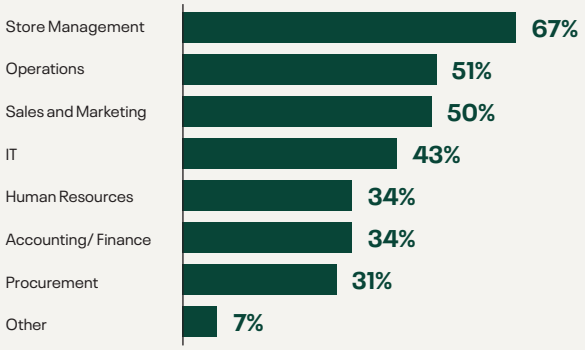
Type of Retail Business



Number of Consumer-Facing Locations



Responsibilities



POS Brands Currently in Use