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Introduction and Early Use of Computers in the Finnish Retail Industry

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Abstract

The retail industry in Finland was at the national forefront in terms of computer adoption shortly after the Second World War. Analyzing the societal, organizational, and industry-specific preconditions and the drivers for this early adoption, both at industrial and organizational levels, helps illustrate how this development unfolded inside the four major retailing organizations in Finland from the 1950s to the late 1970s.

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Introduction

Retail organizations were among the first nongovernmental entities to adopt electronic computers in Finland.¹ In fact, in the late 1950s, only two government-run computers were operating in Finland. Thus, the early commercial adoption of computers in Finland stands in marked contrast to the US, where the retail industry was the last major industry to embrace computers.² In this respect, it is interesting to investigate how computer adoption took place in Finnish retailing and, moreover, the reasons behind this development. By doing so, we intend to respond to a relatively recent call for research investigating industrial computer adoption outside the US.³ Moreover, we view adopters as active agents with idiosyncratic needs, applications, and decision-making processes,⁴ situated in a particular (and in this case dynamic) institutional environment that influences their decision making.⁵ The Finnish retail industry in particular is an interesting research area because between the early 1950s and the late 1970s—during which Finland experienced substantial societal changes—the industry was dominated by only four large retail groups: OTK, Kesko, S Group, and TUKO.⁶

In addition to documenting early computer adoption in the industry, we suggest that as a response to changes in their operating environment, Finnish retailers introduced computers to manage their data-intensive routines; improve the effectiveness of their supply chains; and better manage the transactions between their central organizations, regional offices, and stores. (Our study draws on a rich set of data, including both interviews⁷ and various published and unpublished textual material.⁸) However, for

organization-specific reasons, they followed different implementation approaches. Three of the four retailers had been operating punched-card systems since the early 1950s, so computerization in the late 1950s and early 1960s can be seen as a progressive step, rather than a revolution, in automating information processing in the industry.

Early Stages of Computing in Finland

Punched-card-based information processing began in Finland in the 1920s. The first systems were adopted in 1923 by the governmental statistics agency to help produce national statistics. Thus, punched-card systems made inroads into Finland relatively late compared to the US and other Scandinavian countries. Nonetheless, as elsewhere with early punched-card systems, the main use in Finland during these first two decades was the production of statistics for both public authorities (such as for censuses) and individual businesses (for example, for sales reports). However, the Second World War substantially disrupted societal conditions in Finland, halting the further adoption of punched-card systems until the late 1940s.⁹

Computers also made inroads into Finland relatively late, although the time lag in this case was notably smaller. The first computer went into operation in Finland in late 1958, when the state-owned Postal Savings Bank started using an IBM 650. It is not particularly surprising that the first computer in Finland was supplied by IBM because the company already enjoyed a market leadership position in punched-card-based systems. IBM was able to carry over to the emerging market of electronic computers.¹⁰

Although IBM supplied many of the first computers in Finland, especially for business applications, there was also a noteworthy and interesting domestic initiative for building a Finnish computer, ESKO. Nonetheless, even if Finland was not in the international forefront of computer adoption, the core people involved in early Finnish computerization were not by any means ignorant of computers; Finnish scientists followed the field's international developments through their international contacts and through international journals. Moreover, those interested in computers or requiring computing time had access to computers already in operation abroad in Sweden, the US, Denmark, and Germany. Combined with some visibility of computers in the public press, this implies that there was a generally favorable atmosphere that allowed computer adoption to take off in the 1960s after starting in the late 1950s.¹¹

Finnish Retailing in the Precomputer Era

Overall, the Finnish retailing industry represents a fairly typical Scandinavian retail market.¹² To begin with, Finnish retailing has historically been dominated by a few major retail groups, which have on average accounted for more than 90% of industry sales. This concentration had already begun at the beginning of the 20th century, when the first retail cooperatives were founded in Finland. To compete with the cooperatives—especially with regard to economies of scale in procurement and logistics—private retailers started forming their own groups. As this consolidation steadily progressed during the first decades of the century, in the beginning—and throughout—our period of

study, the industry leaders included two cooperative organizations, OTK and S Group, and two entrepreneurially oriented organizations, Kesko and TUKO.¹³

OTK and S Group originated from an association of local cooperatives that had been split into two in 1917: OTK (following socialist ideology) and S Group (following agrarian ideology). TUKO and Kesko were founded later during the war with the Soviet Union (1939–1944) with the initial primary purpose of furthering the interests of independent wholesalers (TUKO) and retailers (Kesko) during wartime rationing. Despite differences in terms of *raison d'être* and commitments in other businesses, retailing can be considered the primary business of these four organizations because their competitive engagement occurred in retailing, and therefore each organization's performance was ultimately determined by its success there. In retailing, the organizations served the same clientele with practically identical products and outlets, thereby rendering them direct competitors.¹⁴

At the beginning of the 1950s, Finland was a rural country with a relatively scattered population. Consequently, the retail outlet network of each retail organization was dispersed, with local, relatively small general stores as the dominant outlets.¹⁵ At that time, computing technology played practically no role in the Finnish retail industry beyond conventional mechanical cash registers and desktop calculators. Instead, the main focus of technological development was in making the day-to-day store operations more efficient, particularly with regard to in-store goods handling and warehousing.¹⁶

Punched-card systems arrived in the Finnish retail industry when Kesko ordered one in 1951, supplied by IBM and delivered in November 1952, to produce order receipts and consignment notes in its headquarters. The system was initially considered an experiment, but as it proved its usefulness, its use was extended during the next five years to producing sales statistics and managing accounts receivable in the headquarters.¹⁷

The adoption of punched-card technology took place in the Finnish retail industry also more generally around that time—in OTK that same year¹⁸ and in S Group's central coordinative organization SOK in 1954.¹⁹ The fourth retailer, TUKO, did not adopt any punched-card-based equipment.

The primary reasons for adopting punched-card technology at this stage seem to have been, as in Finnish industry in general, threefold.²⁰ First, this technology was perceived to provide superior processing accuracy when compared to manual work. Second, it was foreseen that the amount of information to be processed in the industry would constantly increase, eventually necessitating some type of automation. And third, it was conceived possible that punched-card-based systems would provide some immediate “rationalization” benefits in organizational operations. The latter benefits usually did not materialize at this stage because the work saved in manual information processing was typically required to run the punched-card operations themselves (for example, punching the cards manually).

After the Second World War, the Finnish retail industry was strictly regulated due to

challenging postwar societal conditions. For example, each dominant retail group was allocated import quotas for different types of goods. Retail profit margins were also regulated. On the demand side, citizens had to use ration cards to buy most retail goods.

These regulations were gradually dismantled during the first half of the 1950s, creating new competitive opportunities for retailers. At the same time, Finns were increasingly moving from rural areas to urban population centers, enjoying rapidly increasing income levels and becoming motorized. All these developments had major consequences for Finnish retailers. Not only did they face competition again, but the increasing purchasing power of the customer base provided an additional stimulus for them to have more varied selections in their stores. Urbanization and motorization increasingly necessitated a shifting of emphasis from rural general stores to urban and subsequently suburban self-service retail stores.²¹

Perhaps more importantly, at least with regard to this study, was the heightened emphasis on business effectiveness and efficiency, especially regarding information and goods logistics, which was generally seen in the industry as a central means of achieving competitive advantage after deregulation.²² Consequently, this was a central driver of early computer adoption in the retail industry in the late 1950s.

The Arrival of Computers (1959–1964)

Computers arrived in the Finnish retail industry less than a decade after the first punched-

card systems. One of OTK's constituent local cooperatives, Elanto, ordered an IBM 305 RAMAC in 1958 and received it a year later. Elanto managers become aware of the computer in 1957 when they came to see computers as a way to enhance warehouse inventory management. In Finnish terms, Elanto's adoption was early; in 1959 there were only two computers, both governmental-run IBM 650s, in operation in the entire country, at the Postal Savings Bank and the Social Insurance Institution of Finland.²³

Elanto faced some difficulties during its computer system's ramp-up period in the beginning of 1960. For example, it was necessary to allocate numeric codes for products included in the new system. Because no product codes existed at the time, a system including prices for each product was constructed, but many defects due to human error were discovered. Moreover, the system initially suffered from numerous programming errors, which necessitated rewriting the software three times by 1962. After these initial challenges were solved, however, the system was reported to have operated virtually flawlessly.²³

OTK followed suit in 1960 with another IBM 305 RAMAC, the delivery of which, it turned out, necessitated tearing down one of the 5th floor walls at the OTK headquarters building in Helsinki. OTK and Elanto acquired their first computers to automate inventory tracking, store invoicing (that is, invoicing the delivered goods and freight charges from the stores), and selected administrative routines such as payroll accounting. Elanto's systems also provided reports on store-level sales—information that was soon found to be very useful. Investments in these computers, however, were substantive, both

in terms of immediate financial commitments and with regard to the work required to administer and operate the systems. Because both these systems were based on punched-card storage, a significant number of people were involved in producing and managing the cards themselves. For instance, in the first half of the 1960s, OTK employed approximately 10 people just to enter work time data onto the punch cards needed for computing payroll.²³

The second adopter in the Finnish retail industry was the other cooperative organization, S Group. Its central administrative body, SOK, ordered an IBM 1401 in 1960–1961. The computer entered into operation in 1962 within the newly established electronic data-processing (EDP) department, located at the corporate headquarters in Helsinki. SOK acquired this computer to automate selected centrally run administrative processes—namely, the production of sales statistics and invoices. As in the case of OTK, the system relied on punch cards as storage media and was called the “postdelivery system” because everything was recorded after the goods had already been delivered.²⁴

In the early 1960s, all the retailers had started centralizing their warehousing, as national infrastructure, especially roads and telecommunications, were improving rapidly, but Kesko acted on these changes most decisively. The central actor in Kesko was Administrative Director Unto Eskola, who at the beginning of 1962 prepared a plan for a comprehensive logistics reorganization based on a new centralized national warehouse in the Helsinki region to be built around a computer system including electronic data transfer between the warehouse and Kesko’s regional offices. Kesko’s board of directors

approved the plan, and in addition to building the warehouse, Kesko proceeded to order a RCA 301 (marketed in Finland as ICT 1500 by L.M. Ericsson) after first considering the IBM 1401. Kesko choose RCA/ICT over IBM after three Kesko representatives visited existing IBM and RCA/ICT installations in Sweden, France, and the UK during an international trip in August 1962. In addition, the RCA/ICT system simply cost less.²⁵

During the installation in the following year, however, the disk storage system broke down and had to be replaced. For this reason, the system did not become fully operational until the spring of 1964. Nonetheless, immediately after this, the first official electronic data transfer in Kesko—the first in business applications in Finland, and most likely in all the Scandinavian countries—took place between the Joensuu office and Kesko's headquarters (a distance of approximately 400 kilometers) on 23 March 1964. During this pilot stage, data was entered in the regional offices with Addo-X tape punchers and transmitted via AT&E punched-tape transmitters and receivers using the telex network to the headquarters, where the data was manually entered into the main computer.²⁵

The fourth retailing group, TUKO, did not acquire any computers during this period.²⁶

Thus, the four organizations fall into three broad categories with regard to their initial computer adoption. First, OTK and S Group were early adopters, as the first two in the industry to acquire computers. Their reasons for doing so were similar: automating inventory tracking and invoicing, and in the case of OTK, some administrative routines. Second, Kesko, a few years later, followed a more holistic approach by integrating

computer adoption, including developing electronic data-transfer capabilities, into a comprehensive logistics reorganization in conjunction with building a new national central warehouse. And third, TUKO's wait-and-see approach clearly renders it a laggard with regard to computer adoption.

Hardware and Data-Transmission Investments (1965–1969)

Based on its holistic business-centric approach toward computerization in the early 1960s, Kesko moved to the forefront of development, even though its next hardware investment was not particularly significant—another ICT 1500 in 1965, when the new central warehouse was completed. Centrally, Kesko continued refining its in-house electronic data-transmission system between the headquarters and regional offices.²⁷

Apart from the pilot electronic transmissions already mentioned, transferring data had up to this point depended on the transportation of physical punch cards or tapes between the regional offices and the headquarters. In fact, even into the early 1970s, other Finnish retailers often transported punch cards and tapes by car, taxi, or charter airplane (sometimes shared by two or more retailers for cost reasons) from regional offices to corporate headquarters in Helsinki to be processed overnight, and the resulting printouts (including consignment notes and invoices) were similarly transported back the next morning.²⁷

Supported by a new Univac 494 acquired and installed in 1967, Kesko had a full

deployment of its electronic data-transmission system on 2 June 1969. At this stage, the transmission relied on the public telephone network because the telex network was too slow and error-prone. Nonetheless, with this system, users in the regional offices could, for instance, ascertain whether items being ordered were in stock in the central warehouse. However, being in the forefront of technical development, Kesko also struggled with several technical issues related to, for example, system performance and data backup. Kesko also had to build real-time monitoring and telecommunications software for its data-transmission system because no such software was available in the market. Lacking domestic references, Kesko studied the existing online systems of airlines (SAS and BEA) to gain the required expertise to build relatively complex online systems.²⁷

Although around this time Kesko was certainly deriving the most benefits from using computers in the retail industry, OTK (the first to acquire a computer) was technologically most advanced. In the late 1960s, OTK's EDP department, then encompassing approximately 100 employees, was referred to in the industry as the "training department" because other retail organizations actively recruited its skilled personnel who had completed the extensive computer training that the company provided. Indeed, during the 1960s, as Finnish universities were beginning to teach computer programming, most computer-related training relevant for business use was provided by computer suppliers such as IBM. However, employment with a customer was generally required to enroll in this training. In other words, employment with a company providing good training opportunities, such as OTK, acted as a springboard to a

computing career.²⁸

To update its computing system and thus replace its IBM 305 RAMAC system, OTK acquired two IBM S/360 systems, models 30 and 40, in 1967 and 1968, respectively. However, the applications running on the new computers were not significantly different from the first system: accounting, payroll, and inventory management (gradually also encompassing the regional warehouses and later individual stores). Moreover, despite apparent technical know-how, in curious contrast to Kesko, punch cards and tapes remained prominently in use in OKT, and in fact were not completely replaced until the 1980s.²⁸

During this period, S Group essentially replicated the approach Kesko had followed at the beginning of the decade, by building a central warehouse around a new computer system, in this case powered by an IBM S/360. However, S Group's system did not catch up with Kesko in terms of business impact since its plan did not include electronic data-transmission capabilities. This, in turn, resulted in a substantial amount of traffic for transporting physical storage media, particularly punch cards. This is noteworthy because the driving time between the Helsinki region (where S Group's headquarters and the central warehouse were located) and some of the more distant regional offices of S Group—or any of the four retailers, for that matter—could well have taken a full working day or more.²⁹

TUKO, which was losing market share (and eventually lost its market leadership to

Kesko in 1967), started using computers in 1965–1966. It did not, however, follow the industry practice of acquiring its own computer straightaway. It began more cautiously with an outsourcing contract, a quick and cost-effective option. TUKO used Nokia's computing center to computerize the production of sales and client statistics in order to better analyze its sales to local wholesale organizations. Despite this cautious beginning, toward the end of the 1960s, TUKO seems to have recognized and acknowledged the growing role of computing in the industry when it recruited its first computing manager in 1969.³⁰

Thus, whereas Kesko consistently tried to obtain the most business benefits from the computer technology reasonably available, OTK in turn aspired to maintain its technological lead. The efficiency of Kesko's approach is indicated by the fact that during the latter half of the 1960s the number of employees in its regional offices decreased by approximately 1,300, while sales during the same period increased by 8 to 10% annually.³¹ Perhaps encouraged by Kesko's example, S Group adopted a similar business-centric approach several years later, whereas TUKO, apparently complacent because of its earlier market dominance, did not see any pressing need for substantial computerization.

Toward More Comprehensive Systems (1970s)

During the 1970s, all these organizations, including TUKO, eventually reached a stage in computerization that encompassed at least the core aspects of the logistics chain. Kesko

again led the way by pushing the frontier of business-enhancing applications in the early 1970s. At the beginning of the decade, Kesko introduced to the retail stores a guarantee promising a 48-hour delivery, or in their parlance “order today, collecting tomorrow, delivery the day after,” which was essentially based on its electronic data-transmission system. This became a powerful incentive to the client stores not to defect from the Kesko camp. At the same time, Kesko was embracing its electronic data-transmission system by purchasing Uniscope 100 terminals for its regional offices, resulting in 130 such terminals in use by the end of 1972. Kesko ceased to use punch tapes altogether in 1976. Nonetheless, perhaps because of Kesko’s continuing focus on computerizing and streamlining its core logistics system—the foundation of any large retail organization at that time and today—its electronic data-transmission system did not reach individual stores until the early 1980s. Instead, during the entire 1970s, the managers of Kesko’s customer stores still used handwritten order forms, which were typed into Kesko’s system by clerks at regional offices.³²

While S Group was still computerizing its administrative systems such as bookkeeping at the beginning of the 1970s, the emphasis shifted, again following Kesko’s example, to computerizing the whole logistics chain toward the end of that decade. This included starting to develop electronic data-transmission between its computing center, located in the new central warehouse, and the regional cooperative wholesalers. However, the development in S Group, generally speaking, shifted in the 1970s toward decentralized information processing when the local cooperatives started to acquire their own minicomputers to increase the efficiency of their inventory management.³³

S Group/SOK also initiated some innovative actions of its own. An example of these is the introduction of computerized inventory tracking in individual stores in the early 1970s. However, because of the lack of appropriate electronic data-transmission capabilities at that time, this system was inefficient as it was based on optical forms, which were filled in with a pencil in each store and shipped to the corporate headquarters to be read centrally. Another innovative initiative that S Group developed and introduced during the 1970s was a forecasting functionality in its central procurement system.³³

During the 1970s, OTK's computing capabilities finally started to bear fruit. As an example of its innovation, in the early 1970s OTK sought competitive advantage by optimizing its store locations—that is, establishing or moving stores to locations where there were few existing stores compared to the area's population—a central competitive aspect in retailing, then and now. To accomplish this, OTK developed a store-location-planning application that took population data and information about competitors' stores (their locations, types, and estimated sales) as input data and provided suggestions for prospective store locations as output. Gathering the input data, however, required substantial manual labor since OTK's personnel had to visit each of their competitors' stores incognito to collect all the necessary store data.³⁴

On a more general level, OTK embarked on developing a major organization-wide “total system” (as it was internally labeled) in 1975. This system, completed in 1977, covered all OTK's core business processes and initiated a move from mainframe technology to

decentralized computing, with minicomputers being installed in the regional warehouses. Computerization also reached OTK individual stores toward the end of the 1970s when the company became the first in the industry to introduce point-of-sale terminals in its stores. However, OTK did not have comprehensive organization-wide electronic data transmission to support these systems until the early 1980s and hence could not reap all of its systems' benefits. Instead, throughout the 1970s, data were often transmitted on magnetic tapes, which were physically transported between data-processing locations, sometimes several hundred kilometers apart.³⁴

Having witnessed its market share drop by half in the previous two decades, TUKO was motivated to conform with prevailing industry practices, including computing, at the beginning of the 1970s. As one noteworthy example of such conformity, TUKO embarked on developing Tukku-7, a comprehensive business system covering seven core functionalities: warehouse inventory, invoicing, customer statistics, purchase statistics, accounts payable and receivable, warehouse optimization, and order processing. TUKO's somewhat cautious approach toward computing, however, was still present; Tukku-7 was developed jointly by TUKO, 10 local wholesalers, the Finnish Wholesaler Association, and Nokia.³⁵

When Tukku-7 was introduced in 1972, it was run on an outsourcing basis, first in Nokia's computing center and a little later by another computing company, Tietolaari Oy. However, TUKO had no authority over which, if any, computing systems its local wholesalers used. Thus, when TUKO failed to convince all the wholesalers in its camp

about the benefits of Tukku-7, many of them either purchased comparable systems from independent vendors or developed such systems in-house themselves. Consequently, Tukku-7 remained in rather limited use, and despite some scattered experiments with online terminals, the backbone of TUKO's ordering system throughout the 1970s was print catalogs. These catalogs were periodically mailed to all customer stores, and manually filled order sheets were mailed to TUKO headquarters to be entered into Tukku-7.³⁵

As another significant example of its conventional approach, TUKO revamped its logistics system in 1974 by building a new national central warehouse supported by a new computer system—a move already made by Kesko and S Group. The installation of this system, a Honeywell 64/20, coincided with the warehouse's completion in 1976. The ownership and operation of this new computer was, however, transferred to Tukkutieto Oy, a joint computing company founded in 1974 by TUKO and the Helsinki Central Wholesale.³⁵

As the 1970s ended, all the major Finnish retail organizations had a computer system at their disposal that encompassed, at a minimum, the core wholesaling functionalities supporting their retail business. However, only Kesko possessed comprehensive electronic data-transmission capabilities. This undoubtedly gave it a significant time-based competitive advantage over all the other retailers, which still relied on transporting physical media such as punch cards and tapes, magnetic tapes, optical forms, and even handwritten order forms. Despite this, the other retailers were apparently convinced that

electronic data transmission would be prevalent in the industry, especially in billing, in the foreseeable future, because all the retailers played an instrumental role when the Finnish electronic message standard KOTVA was devised in 1974.³⁶ This became a de facto standard relatively quickly in industrial electronic data interchange in Finland before the international EDIFACT standard started to gain popularity toward the beginning of the 1990s.³⁷

Figure 1 summarizes these central events with regard to each of the retailers from the beginning of the 1950s until the end of the 1970s. From a competitive perspective, the figure also displays the each organization's market shares (in terms of the percentage of sales that each of the four retailers had with regard to their combined sales).

Insert Figure 1 around here

Prerequisites and Drivers of Early Computerization

What led the Finnish retail industry to be in the national forefront in computer adoption? Throughout the period of study, the Finnish retail industry was concentrated, consisting of only a few relatively large retailers with sufficient resources—both financial and organizational. According to a contemporary survey, a decisive issue in computer adoption in Finland was the significant cost of early computers.³⁸

Moreover, of the four retailers, OTK, Kesko, and S Group had used punched-card systems in the 1950s and thus were already familiar with computing technology when the first commercial electronic computers became available. All three organizations also actively participated in international retail and wholesale networks, which enabled them to follow how their foreign counterparts embraced computing.³⁹ This gave them a good understanding of how they could apply computers in their operations once they became available.

In general, the Finnish retailers first sought to enhance their administrative and logistic processes—with regard to speed, cost, and accuracy—that involved repeated processing of large, steadily increasing volumes of data. For example, in 1957, Elanto was processing more than 20,000 individual orders from the stores daily, and it ordered its first computer a year later to address the challenges caused by this volume. In turn, the first application areas for Kesko and S Group were warehouse management and invoicing routines. For example, in the mid-1960s Kesko sought to reduce 350 man years from its regional offices through computerization.⁴⁰

The retailers were continually seeking ways to improve the efficiency of their supply chains. Initially, this was driven by the end of governmental regulation in the early 1950s, which gave rise to renewed competition in the industry. Moreover, significant improvements in road and telecommunications infrastructure in the late 1950s and early 1960s enabled retailers to improve the efficiency of their supply chains with increased

centralization, which in turn, also necessitated advances in information processing. This is most evident in the case of Kesko, where such comprehensive computer-enabled logistics reorganization was initiated in early 1962. S Group and OTK followed suit by similarly centralizing their logistical distribution hubs in the later 1960s.

Lastly, the retailers sought to increase their legitimacy toward their key stakeholders by providing them with more accurate and extensive data about their operations, and computers were generally seen as a means to achieve this. For Kesko, this meant trying to increase the loyalty of its client stores (who could also use other procurement channels) by providing them with more accurate and quickly calculated sales-based discounts.⁴¹ The cooperatives, SOK and OTK, in turn, applied computers to create store-level sales reports, manage delivery charges for the stores, and provide the local cooperatives with fact-based evidence for decisions related to areas such as assortments and prices.

Conclusions

According to our research, there were three primary reasons generally driving early computer adoption in the Finnish retail industry:

- the need for more efficient information processing of high-volume repetitive routines;
- a trend, set off by industry deregulation and societal changes, toward more efficient and centralized logistics and necessitating more advanced information processing; and

- the need to increase transparency and quality in reporting and invoicing for different organizational stakeholders.

Our study also highlights two important prerequisites for computer adoption in the Finnish retailing:

- prior experience with punched-card-based information processing and international access to follow retail industry computerization elsewhere and
- concentrated industry structure with only four relatively large and well-resourced organizations.

Of these, the concentrated industry structure and prominence of organizational stakeholders are, especially compared to the US retail industry, rather specific idiosyncrasies of the Finnish retail industry, which at least to some degree, explain why in Finland the retail industry was at the national forefront in computer adoption instead of being a late adopter, as was the case in the US. Compared to the four dominant retailing chains in Finland, in the mid-1950s there were about 250 large grocery chains operating in the US. Although computer adoption started earlier in the US, both in general and in the retail industry in particular (around the early and mid-1950s), the Finnish retail industry was in the national forefront in computerization.⁴²

The Finnish retail industry first computerized administrative routines (such as payroll computation) and applied computers to improve the efficiency of supply-chain operations (such as inventory tracking and invoicing). However, although computers were first seen

as a means to enhance organizational efficiency, fairly soon Finnish retailers also started to develop applications to enhance their competitive positions. Toward the end of the period of study, the focus gradually shifted toward improving the overall efficiency of the whole core logistics process supporting each retailer's retail operations. Thus, it was not the stores, but the central retail organizations and their needs that mainly drove computerization in the industry.

Nonetheless, the four retailers did not act in lockstep in computer adoption. Kesko consistently pursued the tangible business benefits that computer technology could provide. OTK, in turn, was more concerned with technological advancement than all the practical uses of such knowledge. OTK also suffered from a minor "brain drain" to Kesko and S Group during the 1960s and could not achieve the business benefits available until the 1970s. Despite its early initial adoption, S Group generally seems to have followed the path paved by Kesko, with a time lag of some years.

Finally, apparently complacent with its initial dominant market position, TUKO saw no need to increase its central coordination with regard to computer technology until its market position had worsened sufficiently at the beginning of the 1970s. Moreover, TUKO was hampered in doing so because it lacked strong central management organization.

Kesko was perhaps organizationally the best positioned of the four retailers to adopt computers in the early 1960s because it already had a central organization that was

heavily focused on improving its logistics chain. The key manifestation of this was the major logistic restructuring built around a new central warehouse, which in turn was designed based on a new computer system. The cooperatives OTK and S Group adopted computers earlier than Kesko but could not subsequently push the frontier in putting computers into most productive use in the industry because of their more fragmented logistics chains and governance models with their local warehouses and relatively independent cooperatives. Correspondingly, it seems that the main reason for TUKO's late computer adoption was its disintegrated group structure, in which the central coordinative function had no role in developing the operations of the local wholesale businesses until the 1970s. Indeed, at the beginning of our period of study, TUKO served mainly as a procurement consortium for its constituent local wholesale organizations. However, one major impetus for TUKO's change of mind concerning computers after the mid-1960s was that Kesko gained in market share at the expense of TUKO and eventually replaced TUKO as the market leader in 1967. In any event, business realities evidently finally forced the more conservative TUKO to acknowledge and conform to industry trends with regard to computerization.

While the cooperatives OTK and S Group followed relatively similar paths during the early phase of computing, the two entrepreneurially oriented retailers, Kesko and TUKO, had strikingly dissimilar approaches. The main reason for this was the different locus of entrepreneurship. Kesko was owned by independent retailers, which had given the central organization a strong mandate to manage supply chain operations, which in turn were the typical application areas for the first computers in the industry. Thus, Kesko could, at an

early stage, deploy computers to further improve the effectiveness of these processes. TUKO, however, was owned by independent wholesalers, which were in charge of their own logistical processes, so the role of TUKO's central organization in the 1960s was mainly concerned with centralized procurement. Thus, TUKO's multilayer structure effectively slowed the computer investments in the group by disintegrating supply chains, investment capital, as well as new development initiatives.

Computerization was not by any means the only driver of retail competition in Finland during our period of study. However, it is perhaps telling that Kesko, at the forefront of this development, can be perceived as the "winner" of the period in tripling its market share (see Figure 1), whereas the most recalcitrant computer adopter, TUKO, witnessed its market share decline by half during the first decades of computing in the industry.⁴³

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1. In Finland, the retailing, banking, and insurance industries were the first major industries to embrace computers for business use (at the end of 1950s and the beginning of the 1960s); see A.T. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta* [This is How Finland Was Made into an Information Society], Talentum, 2003.
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3. J.W. Cortada, “The Digital Hand: How Information Technology Changed the Way Industries Worked in the United States,” *Business History Rev.*, vol. 80, no. 4, 2006, pp. 755–766.
4. G. Alberts, “Appropriating America: Americanization in the History of European Computing,” *IEEE Annals of the History of Computing*, vol. 32, no. 2, 2010, pp. 4–7; J. Yates, *Structuring the Information Age: Life Insurance and Technology in the Twentieth Century*, Johns Hopkins Univ. Press, 2005.
5. See T. Misa. “Understanding ‘How Computing Has Changed the World,’” *IEEE Annals of the History of Computing*, vol. 29, no. 4, 2007, pp. 52–63.
6. OTK stands for OsuusTukkuKauppa [Cooperative Wholesale] and TUKO for TukkuKauppojen Oy [Wholesalers’ Ltd.]. Kesko derives from Kauppiaiden KESKus Osakeyhtiö [Retailer’s Central Ltd.]. S Group refers to a number of cooperative enterprises constituting the group, with SOK (Suomen Osuuskauppojen Keskuskunta [Central Organization of Finnish Retail Cooperatives]) as its central coordinating

organization.

7. We interviewed nine senior IT professionals, each employed by one or more of the four retailers. All interviews were conducted by M. Valorinta: P. Hakala (IT Specialist and later IS manager at OTK), 6 July 2007; P. Juhola (TUKO's first IT manager), 21 Dec. 2009; K. Kiviharju (IT specialist and IT manager at OTK, later IT manager at S Group), 16 May 2007; E. Kohonen (IT specialist at TUKO, later IT manager and CIO at OTK), 4 July 2007; I. Laakso (administrative director at TUKO), 18 Dec. 2009; I. Luukkonen, (IT specialist at OTK), 27 June 2007; P. Peitola (IT specialist and IT manager at Kesko), 29 May 2007; S. Polojärvi (IT specialist and IT manager at TUKO), 13 June 2007; and A. Valkama (IT specialist at and later CIO of S Group), 30 May 2007. All the interviews were semistructured, lasting 1.5 to 2 hours, and were recorded. We used follow-up discussions and email correspondence to complete and verify the data we derived from the interviews. Additionally, we talked to retail industry experts (such as an IBM retail industry account director in Finland in the 1960s and 1970s) and to other knowledgeable executives from the case organizations. These discussions gave us contextualizing background information but are not used in this study as formal sources.

8. The data come from six sources types: historical studies on information technology adoption and use in Finland in general, historical studies on information technology adoption and use in the Finnish retail industry, academic studies of the Finnish retail industry, retailers' official corporate histories, retailers' annual reports, and retailers' corporate archives.

9. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, pp. 15–17, 61–65. L. Heide, *Punched-Card Systems and the Early Information Explosion 1880–1945*, Johns Hopkins

Univ. Press, 2009, pp. 128–137.

10. P. Paju, “National Projects and International Users: Finland and Early European computerization,” *IEEE Annals of the History of Computing*, vol. 30, no. 4, 2008, pp. 77–

91. Concerning IBM’s market position, see also H. Andersin, “The Role of IBM in Starting Up Computing in the Nordic Countries,” *History of Nordic Computing*, J. Bubenko, J. Impagliazzo, and A. Sølvberg, eds. Springer, 2005, pp. 33–43.

11. Paju, “National Projects and International Users”; P. Paju, “*Ilmarisen Suomi*” ja sen tekijät. *Matematiikkakonekomitea ja tietokoneen rakentaminen kansallisena kysymyksenä 1950-luvulla* [Building ‘Ilmarinen’s Finland:’ The Committee for Mathematical Machines and Computer Construction as a National Project in the 1950s], Univ. of Turku, C 269, 2008.

12. H. Paavola et al., “The Finnish Retail Market: Overview,” *European Retail Research*, vol. 23, no. 1, 2009, pp. 183–214.

13. H. Tervo, *Kotimaankaupan suuntaviivat vuoteen 1995* [The Directions of Domestic Trade until 1995], Univ. of Jyväskylä, 1986, pp. 65–67.

14. J-A. Lamberg et al., “Competitive Dynamics, Strategic Consistency, and Organizational Survival,” *Strategic Management J.*, vol. 30, no. 1, 2009, pp. 45–60.

15. N. Home, *Kyläkaupasta Supermarkettiin* [From Village Shop to Supermarket], Gaudeamus, 1977.

16. K. Hoffman, *K-Kauppan historia* [History of Kesko], Kauppiainien kustannus, 1983, p. 323.

17. Hoffman, *K-Kauppan historia*, pp. 402–403.

18. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, pp. 123–124.

19. T. Herranen, *Yhdessä eteenpäin—SOK 100 vuotta* [Forward Together—SOK 100 Years], Edita, 2004.
20. K. Kivistö, “Teollisuuden atk:n alku Suomessa” [The Early Stages of Industrial EDP in Finland], *Tietotekniikan alkuvuodet Suomessa* [The First Years of Information Technology in Finland], M. Tienari, ed., Suomen ATK-Kustannus, 1993, pp. 127–140.
21. Home, *Kyläkaupasta Supermarketiin*, pp. 122–129; Lamberg et al., “Competitive Dynamics, Strategic Consistency, and Organizational Survival.” Similar developments have been documented in the retail industry elsewhere in Europe; see J. C. Maixe-Altes, “Interpreting the Early Stages of the Self-service Revolution in Europe: the Modernization of Food Retailing in Spain, 1947–1972,” MPRA Papers, no. 18164, 2009.
22. Home, *Kyläkaupasta Supermarketiin*, pp. 122–129.
23. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, pp. 71–72; K. Kiviharju, interview; I. Luukkonen, interview; Y. Runko, “Materiaalivalvonta ja tietojenkäsittely, Kokemuksia ETK:n käyttöönotosta keskusliikkeen varastonvalvonnassa” [Material Control and Computing, Experiences from Introducing EDP in the Warehouse Control of a Central Organization], internal memo, Kesko, 1963.
24. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, p. 125; Herranen, *Yhdessä eteenpäin—SOK 100 vuotta*; A. Valkama, interview.
25. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, pp. 125–131; “Lausunto muutamista ETK-koneiden toimittajista” [Statement concerning a few EDP equipment suppliers], internal memo, Kesko, 1962; Hoffman, *K-Kauppan historia*, pp. 403–405; O. Kimmo, “Kun tapahtumakäsittely tuli Keskoon” [When Transaction Processing Came to Kesko], *Tietotekniikan alkuvuodet Suomessa*, Tienari, ed., pp. 471–475; A. Kivekäs.

“Tietojenkäsittelyn esivaihe” [Early Stages of Information Processing], internal memo, Kesko, 1979.

26. I. Laakso, interview; P. Juhola, interview.

27. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, pp. 129–133; Kimmo, ”Kun tapahtumakäsittely tuli Kescoon,” pp. 471-475; K. Kiviharju, interview; Kimmo, *Tiedonsiirto Keskossa*, p. 5; E. Kohonen, interview.

28. I. Luukkonen, interview; K. Kiviharju, interview.

29. A. Valkama, interview; Herranen, *Yhdessä eteenpäin—SOK 100 vuotta*.

30. I. Laakso, interview; P. Juhola, interview.

31. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, p. 128.

32. Hoffman, *K-Kauppan historia*, pp. 405–407; P. Peitola, interview; Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, pp. 133–135.

33. A. Valkama, interview.

34. K. Kiviharju, interview; P. Hakala, interview; I. Luukkonen, interview.

35. S. Polojärvi, interview; I. Laakso, interview; K. Kiviharju, interview; P. Juhola, interview; TUKO, “Siirrymme uuteen atk-järjestelmään” [We Are Making the Transition To a New ADP System], internal memo, TUKO, 1972; E. Kohonen, interview; TUKO, “Elintarvikejaoston Erikoiskiirtokirje, Liite 1” [Special Circular Letter of the Groceries Division, Appendix 1], 1973; TUKO, internal newsletter, 4 Oct. 1974 (in Finnish).

36. I. Luukkonen, interview. KOTVA stands for KOneellinen Tietojen VAIhto [Computerized Exchange of Information].

37. P. Vahtera. “Verkkolaskut käytännössä, osa 1” [Electronic Billing in Practice, Part One], *Tilisanomat*, no. 5, 2002, pp. 43–51; E. Kohonen, interview; K. Kiviharju,

interview

38. Manninen, *Näin tehtiin Suomesta tietoyhteiskunta*, p. 69.

39. A. Valkama, interview; Hoffman, *K-Kauppan historia*, p. 323; Y. Runko, “Miten elettiin reikäkorttikaudella” [How We Lived in the Punch-Card Era], *Tietotekniikan alkuvuodet Suomessa*, Tienari, ed., pp. 452–458.

40. Y. Runko, “Materiaalivalvonta ja tietojenkäsittely, Kokemuksia ETK:n käyttöönotosta keskusliikkeen varastonvalvonnassa;” A. Kivekäs, “Reikäkorttikoneet Keskosssa” [Punch Card Machines in Kesko], internal memo, Kesko, 1980; M. Kotilainen, “Keskusvarastot ja ETK-koneet Keskon organisaatiossa” [Central warehouses and EDP machines in Kesko], internal memo, Kesko, 1962.

41. Kivekäs, “Reikäkorttikoneet Keskosssa;” A. Kivekäs, “Tietojenkäsittelyn esivaihe” [Pre-computer Era], internal memo, Kesko, 1979.

42. Cortada, “Commercial Applications of the Digital Computer in American Corporations, 1945–1995;” J.W. Cortada, *The Digital Hand: How Computers Changed the Work of American Manufacturing, Transportation, and Retail Industries*, Oxford Univ. Press, 2004.

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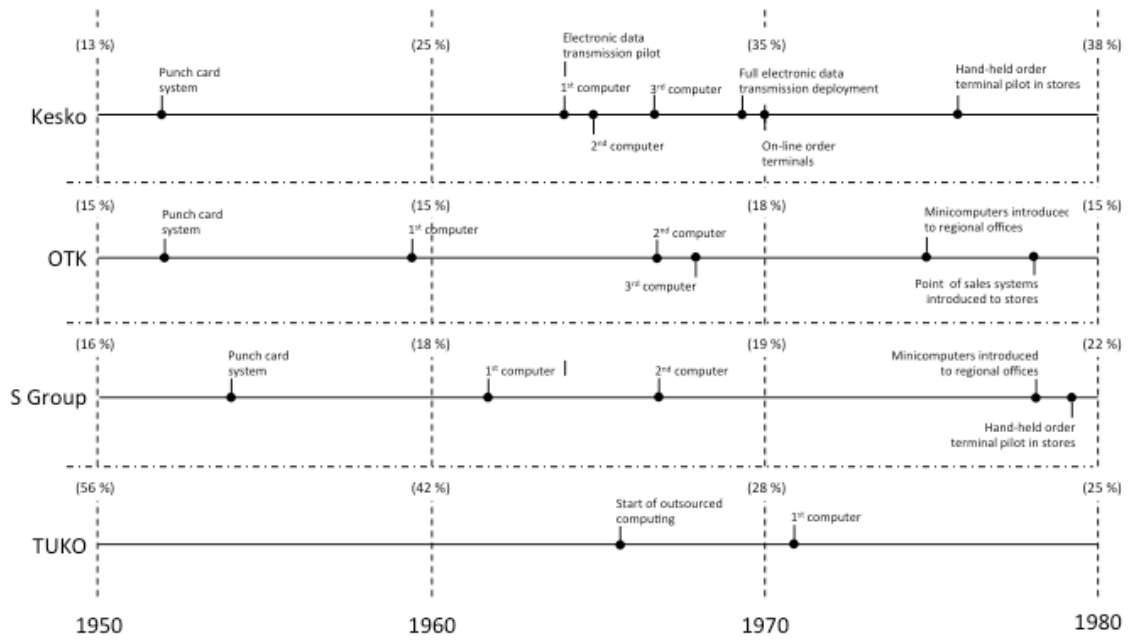


Figure 1. Key events in computing technology adoption in the Finnish retail industry from 1950 to 1980. Mutual market share percentages are in parentheses, with international introductions of named computers depicted with triangles.