

Offline card payments as a payment contingency measure

The Danes have fully embraced digital payment solutions. This means that Danish citizens' payments are highly dependent on the digital payment solutions functioning in stores. In Denmark, it is possible to use the vast majority of payment cards even if the underlying payment systems or the internet are unavailable.

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In Denmark, conditions are favourable for offline card payments to constitute a payment contingency measure

Offline card payments can constitute a national payment contingency measure in Denmark. This presumes that relevant parties involved in card payments allow offline payments with the most widely used payment card brands and types in Denmark. Additionally, it is important that the parties involved establish and follow clear rules for the application of the offline solution.



Most Danes can maintain a basic level of spending for ten days with offline card payments

An offline payment is made as a regular card payment and therefore only requires use of a physical payment card and the entering of a PIN. Even though there are limitations to the offline functionality of payment cards, most Danish citizens will be able to maintain a basic level of spending for approx. ten days with a payment card. However, in a situation where it is necessary to make offline card payments, it is important that Danes limit their spending to essential needs.



Multiple payment solutions contribute to further increasing the resilience of payments in Denmark

The Danes' access to several different payment solutions and the stores' acceptance of more solutions contribute to increasing the general resilience of payments in Denmark.

Why is this important?

One of Danmarks Nationalbank's most important tasks is to contribute to ensuring that payments can be and are effected securely and efficiently. Concomitant with analogue means of payment, such as cash, playing a decreasing role, digital payment solutions have become essential for the exchange of goods and services between individuals and businesses. Security is high on the agenda, but it is possible that, for example, cyber incidents may impact digital payment solutions. It is therefore important to have a digital payment contingency plan that enables citizens to maintain a basic level of spending.



Topics

Payments

Digitalisation

01 Offline card payments as a payment contingency measure in Denmark

The Danes have fully embraced digital payment solutions. Payment cards and mobile payments are by far the Danes' preferred payment solutions. In 2023, digital solutions accounted for approx. 9 in 10 payments in physical trade.¹

The digitalisation of payments has made it faster and easier for most citizens to make payments. However, it has also meant that their payments rely heavily on electricity, network connection and a resilient digital payments infrastructure.

Denmark has a secure and efficient digital payments infrastructure.² It is therefore extremely rare that the digital payment solutions do not function and the customers are unable to use digital payment solutions in Danish stores. Cases in which they do not function are typically related to short-term or local incidents in the individual store or for the individual citizen.³

The digital payment systems are complex, have many dependencies and may be time-consuming to restore. In the event of, for example, a serious cyberattack, it cannot be ruled out that situations may arise where it is not possible to connect locally or nationally to the underlying payment systems for a period of time. From a societal perspective, it is therefore important to have a payment contingency plan that allows Danes to continue to buy basic necessities even if it is not possible to carry out digital payments using the normal procedure.

Offline card payments have the potential to cover most Danes' basic spending for ten days

As long as there is electricity, virtually all payment cards issued by Danish banks to individuals aged 18+ years can be used to make so-called offline payments. It allows the cardholder to make payments using their payment card in a store even if the store's payment terminals are not connected to the payment systems.

Although there may be differences in the volume and size of offline payments that can be made using the different card types in Denmark, most payment cards have the technical prerequisites to cover Danish citizens' need for basic necessities for approx. ten days. The solution can thus serve as a societal payment contingency measure in Denmark in situations where the ordinary digital payment solutions do not function. However, this presumes that the relevant parties involved in card payments allow offline payments for the most widely used card brands and types in Denmark, see box 1.

¹ Danmarks Nationalbank's household survey 2023, see box 2.

² Danmarks Nationalbank, Oversight of the financial infrastructure 2022, *Danmarks Nationalbank Report*, April 2023

³ According to Danmarks Nationalbank's household survey 2023, see box 2, 1 in 4 Danes have experienced in the past year that a physical store has not been able to accept a card payment for technical reasons. Danmarks Nationalbank's monitoring of the retail payments infrastructure has not identified or observed key incidents in the infrastructure, which suggests that citizens' experience may be due to local and temporary disruptions in individual stores.

Favourable conditions for offline card payments as a payment contingency measure in Denmark

Offline card payments can generally also be made in other countries, as the functionality is based on the chip of payment cards and on common international standards. However, the cardholder's bank must first authorise the use of offline payments while the merchant's (store) card acquirer must accept offline payments.⁴

BOX 1

Relevant parties involved in an offline card payment

A card payment, including an offline payment, involves several relevant parties. The individual parties work together in a coordinated process, collectively enabling the cardholder to make payments with the payment card. Therefore, it is crucial that the parties permit and accept offline card payments for the solution to constitute a societal payment contingency measure in Denmark.

The card company owns the card system and the associated licensing rights for the card brand. The company establishes requirements, such as security procedures and guidelines for card issuance, that card issuers and card acquirers must adhere to. Simultaneously, the card company establishes the overall rules for offline payments with the company's payment card. The most widespread card companies in Denmark are Dankort, Mastercard and Visa. For offline payments to constitute a societal payments contingency measure, it is necessary for the card companies' rule sets to permit offline payments.

The card issuer is typically the cardholder's bank. The card issuers enter into agreements with the card company and thereby obtain a license to issue the card company's payment cards to their customers. For most brands and types of payment cards in Denmark, it is the card issuer who, within the framework of the card company's rules, determines whether the cardholder can make offline payments with the issued card. Typically, the card issuer limits the use of offline payments by encoding offline spending limits in the payment cards' chips, see box 3. To ensure that most Danish citizens can maintain a basic level of spending over an extended period with their payment cards, for example, 10 days, it is important that the card issuer's limitations on offline payments do not impede this.

The card acquirer also enters into an agreement with the card company and, in turn, obtains a license to process payments on behalf of the payee. In Denmark, only Nets acquires payments made with Dankort, while several acquirers offer processing of payments made with international payment cards, including Mastercard and Visa. It is the card acquirer who determines whether a payee can accept offline payments. Currently, the largest acquirers do not accept offline payments with all types of payment cards in Denmark, including some of the most widely used card brands and types. To ensure that Danish citizens can make offline payments in a situation where the internet or payment systems are unavailable, it is therefore necessary for card acquirers in Denmark to accept offline card payments with the most widely used card brand and types issued in Denmark.

The terminal provider delivers technology and services to the payee, enabling the processing of card payments. This may include providing payment terminals, technical support, data communication, etc. In Denmark, the terminal provider and card acquirer are typically the same entity. Terminal providers supply the necessary software and hardware to allow the payee to accept offline card payments. It is therefore important that terminal providers support the ability to make offline payments on their payment terminals.

The payee is typically a store and enters into an acquiring agreement with a card acquirer to be able to accept payments with a payment card of a specific brand. It may be necessary for the payee to enter separate agreements with the card acquirer and terminal provider to accept offline card payments. To ensure that Danish citizens can purchase essential goods in a situation where it is not possible to carry out digital payments using the normal procedure, it is important that socially critical players in the retail trade, including grocery stores and pharmacies, have sufficient storage capacity in their payment terminals to receive offline payments for an extended period, for example, 10 days.

⁴ The other relevant parties, i.e., the card company, terminal providers etc., must also authorise the use of offline payments, see box 1. However, the cardholder's own bank ultimately decides whether an offline payment can be made with the issued card, while the merchant's card acquirer decides whether an offline payment is accepted in the store, see section 3.

Danish banks have historically allowed their customers to make offline payments – first with the introduction of the Dankort card and then with international payment cards such as Mastercard and Visa.⁶ Hence, there are already favourable conditions for the solution to function as a national payment contingency measure in Denmark.

⁶ The Dankort card was launched in 1983 as an alternative to cheques, among other means of payment. The card is a special debit card with which payments are made without a balance check.

02 In-store purchases depend on electricity

A payment contingency measure must be able to support payments in situations where it is possible to buy goods. This requires that the stores remain open. For stores to remain open, they must be able to maintain fundamental and basic functions such as refrigerating goods, using cash registers, lighting up stores etc. The largest supermarket chains in Denmark have indicated that without electricity the operation of their stores will be significantly impacted, leading to closure or limited opening hours. Consequently, during power failures, it will hardly be possible to purchase goods in most stores in Denmark.

Different scenarios entail different payment needs

The most likely situations where regular card payments and mobile payments do not function will be short-term and local incidents. They may, for example, occur as a result of damage to local telecommunications cables caused by construction work, where the network connection of a store or payment provider is lost, or by faults in the stores' cash register systems.

The largest players in the retail trade and the payment service providers in Denmark state that they have detailed plans for how to handle such situations to ensure that the citizens can still buy the goods they need. If, contrary to expectations, these plans cannot handle a certain type of minor incident, the citizens will often have the option to postpone their purchases or choose another nearby store that can receive payments.

In the event of a prolonged disruption of a systemic nature, for example as a result of a serious cyberattack against digital central systems, critical technical faults or natural disasters, Danes will eventually need to buy basic necessities, including food and medicine. In such situations, the need for payments in society will increase the longer the disruption lasts. Maintaining a basic level of spending on basic necessities in extreme situations will therefore require a payment solution where payments can be made without a network connection or without contact to the underlying digital payments infrastructure.

Restoration of information flows, data, systems or infrastructure is potentially time-consuming. It is therefore important that a payment contingency plan can cover the payment need for basic necessities in society for a period of more than a few hours or a few days, for example over a week. It is also relevant to take into consideration that a prolonged breakdown, for example a breakdown in the teledata network, is unlikely to be isolated to the payment systems.

03

Payment cards can maintain Danes' basic spending

A good payment contingency plan is based on solutions and systems that are both known and used regularly by those who need to use them. In Denmark, virtually all individuals have a payment card. According to Danmarks Nationalbank's latest survey, less than 1 per cent of the Danish population aged over 15 does not have a payment card, see box 2. At the same time, payment cards are the most widely used payment solution among Danes in physical trade.⁷

An ordinary card payment is made online and generally requires that the information flows between the parties involved in a card payment function, i.e. between the merchant (store), card acquirer, card-issuing bank, card company etc. In the event of minor disruptions where one or more of the parties are unavailable, the largest card payment service providers have detailed contingency plans and processes which still allow payments to be executed in the ordinary way.

In extreme situations with limited or no network connection or where the payment systems are disrupted, payments cards issued in Denmark have a feature that enables Danish citizens to make offline card payments. These card payments do not require the payment terminal to be connected to the underlying infrastructure.

BOX 2

Danmarks Nationalbank examines offline payments with payment cards

Danish citizens' payments are increasingly made digitally, which means that payments in Denmark have become more dependent on the resilience of digital payment solutions. Danmarks Nationalbank has therefore examined whether it is possible to make payments using payment cards in, for example, situations where the payments infrastructure or the Internet is unavailable.

The insights and messages in this analysis are based on information from the key players involved in a card payment, i.e. retailers, payment terminal providers, card acquirers, card-issuing banks and card companies.

The data insights in the analysis are based on Danmarks Nationalbank's household survey 2023, a survey conducted by Danmarks Nationalbank every second year since 2017.

In the survey, the respondents answered a number of questions about, for example, their payment preferences and about what payment solutions they have at their disposal. Besides, the respondents filled in a payment diary with their payments over a whole day.

The information in the survey was collected by Epinion in spring 2023 and is based on 2,737 responses from a representative selection of Danish citizens. The invitations to participate in the survey were sent by digital and regular mail to ensure representativeness across the whole population.¹

¹The survey is associated with a +/- 1.9 percentage points uncertainty for questions covering the entire group of respondents. The uncertainty is greater in connection with a breakdown by, for example, age groups and sub-questions.

⁷ Danmarks Nationalbank's household survey 2023, see box 2.

An offline payment by payment card is made in the same way as a regular online card payment with a physical card. However, the use of the offline solution typically requires that the card has physical contact with the payment terminal and that a PIN is entered.

Offline payments require the use of the physical card and PIN

All payment cards issued in Denmark basically contain the technology required to make offline payments. The technology is embedded in the chip of the cards. To make an offline payment, it is therefore necessary to pay with a physical plastic card, see box 3.

Mobile payment solutions based on payment cards, such as Apple Pay and Google Pay, generally cannot be used to make offline payments. It is therefore important that Danish citizens ensure that their physical payment cards are available so that they can make offline payments.

As mobile payment solutions become more popular, more Danes use biometrics to approve purchases, typically face authentication or fingerprints. While these newer payment solutions reduce the need to remember and manage PINs in everyday life, it is still important that Danes can remember their PINs for their physical cards. Offline payments with payment cards are in most cases made as a card payment with a PIN.⁸

BOX 3

Offline functionality of the payment card chip

The chip in payment cards is called an EMV chip, also known as a Europay, Mastercard and Visa chip. The chip was developed in the 1990s to replace the traditional magnetic stripe. The aim was to contribute to improving the security and continuity of card payments, including due to Internet connection problems in some parts of the world.

With the EMV chip, it became possible to make local authorisations, which means that payments can be authorised locally in the payment terminal without an Internet connection. It also became possible to encode spending limits, i.e. how large and how many payments the cardholder can make offline.

The chip thereby allows payments to be made even if parts of the underlying payments infrastructure or the Internet are unavailable.

Card payments can be authorised locally in the payment terminal



The card companies set the framework for use of offline card payments

The provisions for the general use of the offline functionality are laid down in the card companies' rules, which constitute the general card issuance and card acquiring framework. The rules also stipulate who is liable for any loss incurred in connection with an offline payment.

The largest card companies in the Danish market, i.e. Dankort, Mastercard and Visa, have different rules for the use of offline payments. However, the card companies present in the Danish market all allow offline payments under certain conditions.

⁸ Contactless offline payments are also possible. However, the amount thresholds for contactless offline payments are significantly lower than for offline payments with PIN verification.

At the same time, there are different rules for who bears an offline payment loss in the event of unlawful use of the offline functionality or if the customer does not have enough money in the underlying account. Typically, the issuing bank bears either all or part of any loss if the store has executed the offline payment in accordance with the card company's rules.⁹

Card-issuing banks set their own restrictions on offline payments with payment cards

Card payments are designed with great emphasis on security. This is reflected in, for example, restrictions on the payment cards, where a number of measures have been taken to minimise unauthorised and inappropriate behaviour. This also applies to the use of offline payments with payment cards, where the banks and card companies cannot continuously monitor the customers' payments for overdrafts or fraud and unauthorised use.

For international debit and credit cards, such as Mastercard and Visa, the holder's own bank issues the payment card and decides whether it can be used to make offline payments. Conversely, Dankort's rules stipulate that it must be possible to make offline payments for all Dankort cards. Even though most cards have an offline functionality, there are also cards that can only be used if there is a network connection and the information flows function – so-called online-only cards. These cards are typically debit cards issued to persons aged under 18.

For international debit and credit cards, the holder's bank sets the limits, within the card companies' rules, on how many and how large offline payments can be made, while the restrictions on Dankort cards are laid down in the card company's rules.

The amount thresholds for international debit and credit cards may therefore differ from bank to bank and are typically set based on a risk assessment of individual customer groups. The restrictions may either be set for a total amount, a certain number of payments or a combination thereof. This means that the banks or card company allows offline payments to be made as long as the accumulated value and the number of payments are below the thresholds set. If the thresholds have been reached, the card must have contact with the underlying system before these are reset and offline payments can again be made.

Payment cards can cover most Danes' basic spending for ten days

The offline thresholds for international debit and credit cards in Denmark are typically set at a few thousand Danish kroner per card, while it is a fair bit higher for Dankort. The thresholds must be seen in relation to the average Dane spending approx. kr. 100 per day on food, medicine and fuel for means of transport, while an average household with two adults and two children spend approx. kr. 250 per day on the same goods.¹⁰

Amount thresholds across the different card types and brands thus allow the vast majority of Danish citizens to maintain a basic level of spending on food, medicine and fuel for approx. ten days. Should it become relevant to activate the payment contingency plan, the citizens' spending must be adjusted so that only necessary goods are purchased.

⁹ Offline payments that are not made in line with the rules of the card systems, for example without local authorisation, will typically result in the liability obligation shifting from the issuing bank to the payment card acquirer. In this case, the acquirer will often pass on the liability to the store that has accepted and executed the payment.

¹⁰ The calculation of the spending of an average Dane and an average household with two adults and two children is based on Statistics Denmark's latest figures from 2021 and then price adjusted to 2023 with figures from the consumer price index. It is assumed that the price changes have not resulted in substitution as these are basic necessities that the households need.

Card acquirers play a crucial role in facilitating offline payments in stores

In addition to card companies and issuing banks enabling offline payments, it is also necessary for card acquirers to accept offline payments with the most commonly used card brands and types issued in Denmark. Ultimately, it is the card acquirer that determines whether an offline payment can be accepted and processed in stores in Denmark.

Easing and adjustments of restrictions may be necessary

For the individual Dane, it may be difficult to keep track of the restrictions that apply to their payment card, one reason being that the banks and card companies typically do not provide information about how many offline payments can be made and the maximum amounts permitted. There are several reasons for this, including competitive considerations and a desire to minimise the risk of inappropriate behaviour. In a situation without network connection or a disruption of the payment systems, the banks and card companies, in fact, cannot refuse to accept the payment or block the customers' cards in case of overspending, fraud or unauthorised use.

Restrictions on the possibility of making offline payments and the lack of transparency may make sense from a risk perspective. Nevertheless, relevant parties involved in a card payment, including card companies, card issuers, card acquirers and terminal providers, should ensure that Danish citizens can purchase necessary goods and services for an extended period with offline card payments across various card brands and types, see box 1. The solution plays a socially important role for the citizens' ability to maintain a basic level of spending, for example in a situation with limited or no Internet access. Hence, it may be necessary for relevant parties to provide information about any restrictions in the use of offline payments with payment cards, to adjust and ease limitations if necessary, and to accept and process offline payments with the most widely used card brands and types issued in Denmark.

Important to have a common understanding of offline card payments and clear rules among the parties involved

As offline payments serve a significant and crucial role as a contingency solution for society, it is essential to establish a correct and common understanding of the solution among all parties involved in a card payment. This calls for transparent agreements, including clear sets of rules, on how and when the offline solution can be used and which party or parties are responsible for any losses incurred in connection with offline payments.

Better opportunity to maintain a basic level of spending with more than one payment card

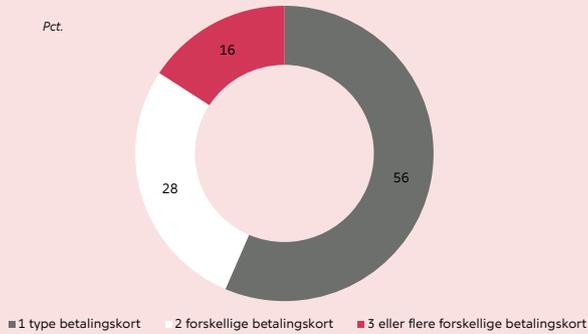
Although one payment card can cover most Danish citizens' spending on basic necessities for ten days, they may still want to consider whether it would be an advantage for them to have at least two payment cards.

If you have more than one payment card that functions offline, you can make more purchases in a situation in which it is necessary to make offline payments with payment cards. You are also better off if you lose one of your cards, if the chip does not work or if you have forgotten your PIN.

Depending on the specific situation, it may also be an advantage to have payment cards of different brands or types, especially if a single card brand or type experiences disruptions. In such situations, it may potentially be possible to make ordinary card payments with a different payment card.

CHART 1

More than half the population has only one type of payment card

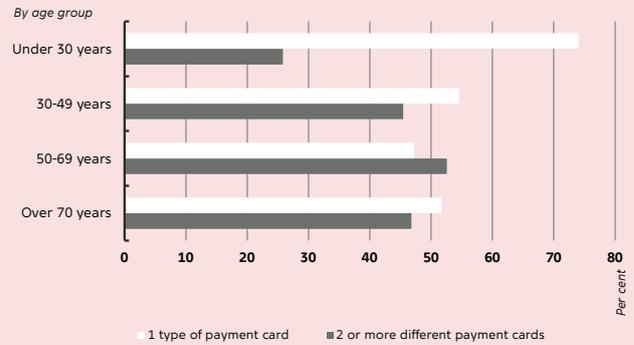


Note: The chart shows the different types of cards held by Danish citizens. The proportion showing Danes with 1 type of payment card may thus have several cards of the same type, for example 2 Dankort cards or 2 credit cards of different brands.

Source: Danmarks Nationalbank's household survey 2023, see box 2.

CHART 2

Especially the younger part of the population has only one type of payment card available



Note: The chart shows the share of Danish citizens who have 1 type of payment card and 2 or more different types of payment cards, respectively. The proportion showing Danes with 1 type of payment card may thus have several cards of the same type, for example 2 Dankort cards or 2 credit cards of different brands.

Source: Danmarks Nationalbank's household survey 2023, see box 2.

While Danish citizens may have several cards of the same type, chart 1 shows that 56 per cent of Danes only have one type of payment card. In addition, there is a big difference in card holdings among different age groups in Denmark. Especially younger people mainly have one specific type of card, see chart 2. It may be relevant for Danish citizens to include the consideration of payment cards of different types or brands when assessing whether they need more cards – and, if so, which.

Offline payments are a payment contingency measure in the retail trade

The largest grocery chains have stated that they have detailed contingency plans that can handle many different situations that affect the operation of their stores. Here, offline payments with payment cards form part of the payment contingency plan of the individual stores in the situations in which contact cannot be established with their payment service provider or the payment systems.

In the stores, the payment terminals play an essential role, as the offline payments are temporarily stored in them. When the transaction can again be concluded, for example when the network connection has been restored, the payment details are forwarded and the payment is processed.

In the event of a prolonged disruption, it is important that the socially critical players in the retail trade can store enough payments in their payment terminals to enable all Danes to maintain a basic level of spending on basic necessities for an extended period.

It is therefore relevant that stores that sell necessities, including grocery stores and pharmacies, consider whether they have enough storage capacity to store transactions in their payment terminals in the event of a prolonged disruption.¹¹ If this is not the case, it will be natural for them to consider increasing their storage capacity, and at the latest when they are to replace their terminals with new payment terminals.

Several payment solutions contribute to the overall resilience of payments

To counter minor disruptions and ensure continuity of payments, it will be an advantage for Danish citizens to have several different payment solutions available. At the same time, it will be an advantage for the stores to accept several payment solutions that use different underlying infrastructures, for example mobile payments that use account-to-account transfers. The possibility for citizens of using several different payment solutions and the stores' acceptance thereof contribute to increasing the general resilience of payment in society.

Cash can also be used in a disruption situation

Cash is also a possible payment solution that Danes can use in a disruption situation if they prefer to pay cash or want to supplement their card holdings. Cash payments can be made without a need for contact with the underlying digital systems, but, like offline payments with payment cards, they require that stores remain open before purchases can be made, see section 2. Based on the situations in which stores remain open, cash is not a more robust payment contingency solution than offline payments with payment cards.

While cash may initially appear to be a reliable backup solution, it relies on citizens either having cash on hand or access to it. However, most Danes carry very little cash for everyday transactions.¹² As a result, most Danish citizens will need to withdraw cash if they wish to make a cash payment, for example, in a disruption scenario. However, it may not be possible to use ATMs, which are the primary points of access to cash in Denmark if network connectivity or the digital payments infrastructure is unavailable. The reason for this is that ATMs do not have offline functionality and depend on the functioning of the payment card infrastructure.¹³ People who prefer or want to pay in cash in a situation where, for example, the Internet is down should therefore be in possession of cash before the disruption occurs.

¹¹ As mentioned in section 2, it may be difficult to assess how long disruptions or breakdowns of the payments infrastructure will last. A possible guideline for the socially critical players in the retail trade may be that the storage capacity of the terminals must not be the restricting factor in the citizens' access to basic necessities. This should be seen in relation to one payment card covering most Danes' spending on basic necessities for more than ten days, see the above. Danmarks Nationalbank has been in a dialogue with some of the largest grocery chains in Denmark, which have stated that their terminals have the capacity to store transactions for more than ten days.

¹² According to Danmarks Nationalbank's household survey 2023, see box 2, half of Danish citizens have either no or very little cash (under 100 DKK) on them for their day-to-day transactions.

¹³ Depending on the type of disruption, it may, in some cases, be possible to withdraw cash from an ATM operated by the card-issuing bank, as long as it is supplied with power.

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The analysis consists of a Danish and an English version. In case of doubt as to the correctness of the translation, the Danish version will prevail.

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