
GLOBAL DEVELOPMENT TRENDS IN PAYMENT CARD INDUSTRY

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Global development trends in payment card industry

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Abstract: This paper presents the most important global development trends in payment card industry. The payment cards industry is specific because it has a high level of multidisciplinary nature since, besides the technological, it also includes various other aspects such as the legal, market, financial, social and even political. Hence, development factors of payment cards are not always only technological in their nature but are often also of market, legal, financial, social and political kind. The aim of this paper is to present these very aspects of development in a simple and concise manner, as much as this is possible, given that because of the multidisciplinary nature, the topics associated with payment cards are often extremely complex and voluminous. At the end of the paper, we detail the situation in Serbia which boasts a very high level of monitoring and realisation of technological and legal solutions available in the world. In addition to presenting development trends in payment card industry, the paper also offers some of the author's critical analysis of certain development trends in the sense of their advantages, shortcomings, problems in realisation and "lessons learned" from previous numerous experiences in the world.

Key words: payment cards, development trends, chip cards, EMV, CPA, contactless payments, e-commerce, PCI DSS, IFR, PSD2, NFC, HCE, strong authentication, 3-D Secure, SRC.

[JEL Code]: C32, G01, E44.

Non-Technical Summary

Because of its pronounced multidisciplinary nature, global development trends in payment card industry are affected by many factors that are not solely technological. These are often market, legal, financial, social and even political factors. Because of the strong competition in the global payment cards market, there are constant challenges in this area both in terms of new business and technological services and solutions, and in terms of problems in the market, such as unsettling healthy competition. This is why two paths for resolving the existing challenges have been dominant in recent times: new technological and new legal solutions.

The milestone in the development of technological solutions in payment card industry took place with the invention of chip payment cards in the 1990s. Chip technology provided the starting basis for later new technical solutions, such as contactless cards and mobile phone payments, and the protection principles of this technology are becoming increasingly present with the latest solutions for the security of online payments.

Besides technological development, the increasingly frequent challenges in the payment card industry are market-related, which is why the implementation of legal regulations in solving these challenges has become quite frequent recently. The aim of the new legal regulations is to correct disruptions in the market, while maintaining the principle of free market, which is not easy to fulfil, therefore each new regulation was usually preceded by years of analyses, consultations, public discussions and even court procedures.

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1 Introduction

Due to the persistently strong competition in the global payment cards market, challenges in this area are constantly present both in terms of new business and technological services and solutions, and in terms of problems in the market, such as unsettling healthy competition. This is why two paths for resolving the existing challenges have been dominant in recent times: new technological and new legal solutions, which is the topic of this paper.

The target group for the topics presented in this paper are primarily professionals whose scope of work includes payment cards or operations more or less associated with payment cards; next, professionals who are beginning or considering to begin to engage in these matters; as well as all those who find this field interesting for one reason or another.

In addition to presenting payment card development trends, the paper also offers some of the author's critical analysis of certain development trends in the sense of their advantages, shortcomings, problems in realisation and "lessons learned" from previous numerous experiences in the world.

2 A brief overview of the history of payment cards

American writer and journalist Edward Bellamy (1850–1898) is considered the originator of the idea of payment cards, as he was the first to use the phrase "credit card" in his Sci-Fi novel *Looking Backward*. In the book, this is a card which each citizen receives from the state, together with certain monetary assets, which he can use for purchasing using the card as a payment instrument.

The first kinds of payment cards are thought to be various types of coins made of plastic, copper, aluminium or steel, differing in shape and size, with embossed account number, merchant's name and symbol, and often with a small hole for attachment to pendants. Such coins were used in the late 19th and early 20th century for identification of accounts for collection in hotels and stores, by recording an imprint of the information on the coin instead of writing it down by hand. This sped up the collection process, though it still was not good enough for client identification, hence problems and fraud were frequent.

The first true payment cards are the so-called Charga-Plate cards that were used in the USA between 1930 and late 1950s. The idea for and the manufacturing of these cards are attributed to Farrington Manufacturing Co. These cards were made from a rectangular piece of metal, with the holder's name, town and state embossed on the metal, and were issued by large department stores to their customers. The information on the card is quickly taken by making an imprint with a piece of white and indigo paper, instead of writing the information down by hand, which accelerated the purchase, and since the store had identification data about the customer, the problems and fraud were limited and acceptable. In addition to being kept by the customer, these cards were often kept at points of sale.

The 1930s saw the emergence of payment cards, first by American and later by other international airline operators (Air Travel Card). These cards were based on a numbering system of card issuers (airline operators) and client's accounts. Payments by these cards were

deferred (the customer was billed later) and they often implied certain discounts. These cards are considered the first international payment cards as they were accepted by all members of the International Air Transport Association.

The Diners Club card, created in 1950, is thought to be the first general use payment card (used with several merchants). It was a credit-type card and the entire debt was charged at the end of the month (charge card). Not long after, there appeared cards with a similar purpose Carte Blanche and American Express, with the latter soon becoming an international card.

The first true credit card (with a credit line based on the monthly collection of a certain percentage of the total remaining debt, i.e. revolving credit) is considered to be the BankAmericard that appeared in 1958, created by Bank of America and gradually licensed to other banks, initially in the USA and later in other countries of the world. Then, in 1976, a new common name for this card was adopted – Visa. Concurrently, as a response from market competition, a group of banks founded the Master Charge in 1966, which would eventually grow into MasterCard.

Over time, Visa and MasterCard became dominant payment cards in the international market, and remain so today. On the one hand, the contribution of these brands to the global development of the payment card industry is unquestionable. However, in time, the activity of the two brands became identified as a sort of monopoly or a duopoly (an increasingly used term), which is supported by the fact that they function very similarly, hold a dominant market share in most countries of the world, have been through similar stages of the transformation of ownership, and recently they are having more and more common owners in their increasingly complex ownership structure. In such conditions, over time we see a growing number of local and national card systems emerge in response to the existing situation, with the goal of demonopolizing and better regulating their markets, as well as lowering costs and the dependence on these two global card systems, which will be looked at more closely in this paper.

3 Chip payment cards as the beginning of the recent history of payment cards

From the 1970s until the 1990s, magnetic stripe payment cards were the dominant technology in the payment card industry. This technology enabled the digitisation of payment transactions via POS readers (point-of-sale reader) and ATMs (automated teller machines), and data transmission networks. However, the magnetic stripe was solely a passive digital medium for reading identification data, with no option of entering data or any other functionalities.

In the 1990s the first payment cards with a chip appeared, first in France (the first payment application on the chip called B4/B0), and then beyond, including the global card systems such as Visa and MasterCard. The main reasons for introducing chip payment cards were security enhancements (fraud prevention) and the possibilities for additional functionalities of payment cards.

As for security enhancements, chip payment cards enabled advanced cryptographic functionalities for highly reliable user authentication (encrypted PIN), identification (digital signature and dynamic authentication) of the card issuer and the card itself, as well as the prevention of payment card skimming. The use of chip payment cards significantly improved the security of transactions.

Regarding additional functionalities of chip payment cards, in addition to the main function of making payments at POS and ATMs, this technology also enabled the use of the existing chip payment card for reliable authentication for online payments, employee identification using the card for access to work premises, identification of citizens for electronic administration services, control of customers' age when purchasing alcohol, various commercial discount programmes for loyal customers (loyalty programmes), buying tickets in public transport, etc. Such additional functionalities were enabled by some card systems, e.g. by the German Girocard (authentication online, identification of citizens for electronic administration services, control of customers' age when purchasing alcohol) and the Japanese JCB (authentication online, identification of citizens for electronic administration services, employee identification using the card for access to work premises, buying tickets in public transport).

To lower the bank costs associated with the manufacturing of chip payment cards for various card systems, in 1994 Visa, MasterCard and EuroPay began a project called the EMV, which implied a common technical specification for chip payment cards for all three card systems, enabling the use of the same chip for all three card systems. In 1996, the first official version of the EMV technical specification was made public, and three years later, in 1999, the EMVCo consortium was founded, with the aim of further maintaining and developing technical specifications for support to chip payment cards. Until today, other card systems joined the consortium – JCB (2004), AMEX (2009), and UnionPay and Discover (2013). In 2005, the first version of a common payment application (CPA) on the chip was issued, and somewhat later, in 2008, the first version of the CPA protocol for contactless payments.

Nowadays, chip payment cards have become common and omnipresent, while the use of the magnetic stripe on payment cards is increasingly rare. However, though the use of the chip led to visible progress in card payments, the progress achieved was not at the level that had been expected and announced. Below we elaborate on this fact in more detail.

One of the main problems which the chip payment card technology brought along was its exceptional complexity and the high price of its implementation. That is why the migration from magnetic stripe to chip payment cards, as well as the implementation itself, was very slow to take place in almost all markets, with few exceptions – these included markets where this technology originated. Therefore, card systems such as Visa and MasterCard were forced to give some encouragements for the migration, and when this did not produce the desired results, they introduced rules shifting the liability for fraud (the so-called liability shift) to the side that did not introduce the chip technology. Lastly, they issued a strict obligation and a deadline for migration, gradually for different markets. After more than one decade, this finally yielded the planned results at the global level.

Though the chip technology enabled a high level of security and additional functionalities, chip cards were not used as much as initially expected, primarily because of the complexity

and implementation costs. For instance, for the majority of optional functionalities (such as reliable authentication with online payments, employee identification using the card for access to work premises, identification of citizens for electronic administration services, buying tickets in public transport, etc.) there has to be an additional application on the chip, as well as more memory, which requires complex implementation and consequently additional costs, as well as the considerably higher final price of a chip payment card. For these reasons, the ideas about additional functionalities on the same chip (on the same chip card) were abandoned over time and instead, additional functionalities were implemented on separate chip cards intended for certain functionalities (e.g. personal ID card with a chip for electronic administration services, a special chip card for payments in public transport, such as the Oyster Card in London, special proximity cards with a chip for employee access control to work premises, etc.).

Interestingly, the most complex part of chip card functionalities is associated with cryptographic operations with offline payments (where payments are executed between a POS terminal and a chip card, without the use of the data transmission network). This pertains to Offline Data Authentication (ODA) process to authenticate the card issuer and the card itself, which requires complex cryptographic operations, as well as complex support on the part of the issuing bank in relation to the cryptographic pairs of keys and certificates. However, this functionality is important in terms of security only with offline payments. As for transactions via ATMs, this functionality is not used, and it is not necessary for online payments on POS terminals given that in this case (as well as with ATMs) a much simpler cryptographic method of card issuer authentication is used – the exchange of ARQC/ARPC cryptograms on a data transmission network, which does not require complex support on the part of the issuing bank in terms of cryptographic pairs of keys and certificates. As offline payments are being gradually abandoned across the globe, so does the need for complex ODA functionality on the chip card cease, without which bank procedures for chip technology would be incomparably simpler and implementation of chip cards much cheaper as well. It is not impossible that this very useful simplification may take place in the near future.

Regardless of the existence of the CPA specification, which offers the possibility of using the same chip application for multiple card systems, in practice Visa and MasterCard still use their special specifications, the so-called VSDC (Visa Smart Debit/Credit) and MasterCard M/Chip, primarily because of the specificities of the M/Chip specification which, as time goes by, deviates more and more from the common CPA specification. Still, given that it is free for use, the CPA specification has become a major basis for the development of many local and national card systems.

Chip payment cards have significantly contributed to the improvement of the security of payment card transactions. However, this only pertains to card payments (card present), and not to card not present payments, such as online payments, manual entries at POS terminals or phone orders, which remain at the bottom security level. This has led to the so-called fraud migration from previous payment manners to dominantly online payments which are less protected. Due to these reasons, a new problem was tackled – increasing the security of online payments, which will be discussed in more detail in the following chapters.

4 Contactless payment cards

The first contactless payment card is thought to be the South Korean Upass, which entered into use in 1995 for payments in public transport. Since 2008, Visa, MasterCard and American Express card systems almost simultaneously began offering contactless payment cards. Today, contactless payments have become very widespread and even dominant in some markets. The most often used are the so-called hybrid chip payment cards which have both contact and contactless payment interfaces.

Initially, contactless cards were intended primarily for specific types of payments implying lower amounts and a faster execution of payments for a large number of buyers at a sales point (fast-food stores, kiosks, public transport, etc). However, at some point, global card systems such as Visa and MasterCard launched a very intensive campaign to introduce this payment manner at all sales points, first through incentives for implementation, and then through a strict obligation to implement this at all sales points.

Some believe that the reason for such campaign is the advantage of these global card systems relative to local and national card systems, as the latter did not have a technical solution for contactless payments available at the time. Though the EMVCo consortium created the CPA specification for contactless payments as well, it is still of a general type, without sufficient technical details that would enable its easier implementation in practice. This fact contributed to the large delay in the implementation of contactless payments with local and national card systems.

In response to the problem of the lack of an open technical specification for contactless payments, Gemalto implemented the PURE specification, as well as the corresponding CPA payment cards available to all card systems; not long after, IDEMIA began offering a similar solution. In March this year, IDEMIA, G&D and NXP established the White Label Alliance (WLA) with the aim of further developing open technical solutions for contactless payments that would be available to all card systems.

Currently, several contactless payment solutions have been implemented by using the said open standards. For now, most implementations use the PURE solution (e.g. Bcard in Bulgaria and EFTPOS in Australia), and there are more plans for using new, announced open solutions as well.

Regardless of the existing problems and initially modest plans for contactless payments, this type of payments will most likely become dominant in the future. This was facilitated by a number of unexpected market requirements, such as simpler and faster payments without the PIN (up to a certain amount), and the outbreak of the coronavirus pandemic where contactless payment was recognized as a desirable measure in combating the pandemic.

5 Payments by mobile phone

The first concept of payments by mobile phone was the so-called m-commerce, which was first mentioned in 1997 in the sense of transferring functionalities of the existing e-commerce (online card payments) to mobile phones. Initially, this new form of payment brought an

advantage only in terms of the greater mobility of buyers who are no longer bound to the computer. Advantages multiplied over time, notably in terms of sending push notifications to the mobile phone, and then in terms of greater security which the mobile phone offers.

In time, the use of mobile phones evolved into various new forms of payment associated with different payment channels (omnichannel).

First, with the emergence of Near-field Communication (NFC) of mobile phones, there also emerged the possibility of contactless payments by mobile phones at a POS terminal. Initially, to implement this payment type, the participation of the mobile phone operator and the SIM card manufacturer was needed, as well as the use of the so-called Single Wire Protocol (SWP), which implied connecting the SIM card and the NFC chip on the mobile phone with a wire through which they could communicate with each other via the SWP. However, because of a large number of users and the complexity of implementation, this solution was not widely accepted in practice.

With the introduction of a new concept called the Host Card Emulation (HCE), there was no longer a need for the above-described complex SWP solution, or for the participation of the mobile phone operator and SIM card manufacturer. The new concept, created in 2012 and more widely implemented as of 2014, implies a software simulation of the chip payment card using advanced cryptographic techniques, which soon gained a much wider application, including the replacement of contactless chip cards with the mobile phone, e-wallets on mobile phones (such as Google Pay and Apple Pay), and a new concept of security for online and mobile phone payments called Secure Remote Commerce (SRC), which will be discussed more in the next chapter.

Interestingly, soon after the emergence of first solutions for payments by mobile phone, mass predictions appeared stating that these solutions were revolutionary and would entirely replace the standard form of payment cards in a very short period. However, although there were many arguments in support of such conclusions, this has not yet happened. The reason is that there are still many limiting factors in practice, such as the following: obligatory NFC functionality which is still a feature of only a small percentage of mobile phones, more expensive ones as a rule; the still relatively complicated settings and use of mobile phones for payments; younger people, with greater technical knowledge as well as regular income, are primarily interested in payment card usage.

Regardless of the existing problems and limitations of mobile phone payments, this type of payment can indeed be considered as one with the best prospects in future, since the mobile phone has become a device we always carry with us. Still, we should not underestimate the continued need of the market for different solutions and payment channels for various purposes and groups of users, hence it is most likely unrealistic to expect that only one type of payment should become dominant over the majority of others.

6 New solutions for online payment security

The first card-based online payments appeared soon after the appearance of the Internet and the first websites, specifically in 1992 on the book sales site www.books.com.

In the beginning of card-based online payments, until 2000, there was no special additional protection for this type of payment, which gradually sparked a number of frauds. As mentioned earlier, with the appearance of chip payment cards, frauds further migrated from transactional payments where payment cards are present (which have become much more secure due to the appearance of chip technology) to online transactions which were less protected. The market responded rapidly with the emergence of new solutions for additional protection in this type of payment, and later with new binding rules, first by card systems, and then by regulators, primarily in the European Union.

The first advanced technological solutions for online payment security were introduced by Visa in early 2000, under the name Verified by Visa, and then under the name 3-D Secure, which was soon accepted by other card associations like MasterCard (under the name SecureCode), Discover (called ProtectBuy), JCB (called J/Secure) and American Express (called SafeKey). All these solutions are based on the 3-D Secure concept, which involves additional protection in 3 domains: card acceptor domain (in practice MPI-Merchant Plug In software module on the merchant's website), card issuer domain (in practice ACS-Access Control Server for cardholder authentication) and the interoperability domain (in practice DS-Directory Server for control and connection of the other two domains).

These 3-D Secure solutions for online transaction security were first optional for payment participants, and then the card system rules introduced the concept of shifting liability to the party that did not implement them (liability shift). The full obligation to use them was imposed only for certain markets that were considered riskier, but not for all markets globally. The method of implementation was not strictly defined in terms of type and degree of protection, but there was a free choice of the method of protection by the participants (e.g. permanent password, one-time password, additional devices such as token devices, etc.).

For a long time, the 3-D Secure concept was owned by Visa (known as 3-D Secure Version 1). Consequently, other card systems had to either develop their own variants of this concept or pay the licence costs to Visa.

Given the numerous mentioned shortcomings of the existing solutions in the market related to the online payment security (absence of mandatory implementation, too much freedom in the choice of the protection degree, lack of an open standard for free use), in 2015 the European Union adopted the so-called PSD2 Directive (Revised Directive on Payment Services), which, among other things, introduced more detailed and stricter obligations for secure online payments. This directive introduced the mandatory implementation of the so-called strong customer authentication, which means the simultaneous application of at least two of the following three authentication mechanisms – something the user knows (e.g. permanent password), something the user has (e.g. a token or a mobile phone) and something the user is (e.g. a fingerprint, a face photo, an iris scan etc.).

In response to the technical requirements defined in the PSD2 directive, in 2016 the EMVCo association published a new, open version of the 3-D Secure specification that can be used freely by all card systems, known as 3-D Secure Version 2. In addition to free use, this directive has brought much wider possibilities for using innovative methods of user authentication including biometrics. This new version of the 3-D Secure specification has already been implemented in most of the European Union, which significantly reduces card

payment frauds in this region and will most likely be disseminated by gradual implementation in the rest of the world, given the similar experiences with chip payment card implementation.

Market reactions to the PSD2 Directive and mandatory two-factor authentication for online payments were initially predominantly negative, primarily due to the necessary investment in implementation and short deadlines. However, after the first implementations, it was recognized that the new version of the 3-D Secure specification offered solutions that can be both more comfortable and simpler for users, and thus more competitive in the market. As an example, the earlier implementation of strong authentication with the complicated use of tokens has been replaced by a simpler use of SMS messages on a mobile phone, and biometric techniques are increasingly being offered which make it even easier for users to authenticate (face or iris recognition via a mobile phone, fingerprint read on a mobile phone, etc.).

Despite the great potential and new possibilities of biometric authentication online, currently the dominant solution in practice is the simultaneous use of a permanent password (what the user knows) and a one-time password sent as an SMS to a mobile phone, which can be considered somewhat burdensome for users. Using biometrics (what the user is) instead of e.g. remembering a permanent password would greatly facilitate authentication. However, when it comes to biometrics as one of the factors of authentication, this area is still in the development phase where there are still many open issues, predominantly related to reliability. Namely, it turned out that it is not enough to use only the so-called static physical characteristics of the user (e.g. facial features, an iris, fingerprints) because they can be copied. That is why the so-called behavioural biometrics have been introduced recently (such as voice recognition, handwritten signature dynamics, typing dynamics, gestures, etc.), which would significantly contribute to reliability and easier user authentication, but on the other hand the implementation of such solutions is extremely complex and often expensive. However, according to previous experiences, if in time there are better and more efficient authentication solutions and they become massified, it would inevitably lead to new accepted standards and cheaper implementation.

Given the great challenges in the implementation of secure online payment, primarily in terms of protection but also easier use, in recent years, global card brands have developed the concept of SRC (Secure Remote Commerce) for which the term “Click to Pay” is often used. On the one hand, this concept offers a simplified and unified use of various secure payment channels by users (from any computer, laptop, tablet or mobile phone), but on the other hand, its implementation is quite complex. The implementation of this concept involves several complex components (SRC system that connects and coordinates other components, DPA-Digital Payment Application through which the user communicates with the system, DCF-Digital Card Facilitator that stores and sends user and payment card data, SRC Initiator that exchanges data between the merchant and the DCF component, and the SRC Participating Issuer which automatically registers users in the SRC system), as well as complex cryptographic solutions based on the 3-D Secure protocol and tokenisation protocols.

For the sake of easier and broader implementation of the new SRC concept (Secure Remote Commerce) for safer and easier online payments, in June this year the EMVCo

association published its technical specification “EMV Secure Remote Commerce Specifications, v1.0”, which will certainly facilitate the implementation of this new concept.

7 Payment card industry data security standard – PCI DSS

With the appearance of the first advanced security solutions in using payment cards, such as chip technology and online authentication, new components and new participants in card systems appeared, which increased the complexity of implementation, and thus the complexity of data protection. For easier and more efficient implementation of the data protection segment, in 2006 the global card systems Visa, MasterCard, American Express, Discover and JCB formed the so-called Payment Card Industry Security Standards Council, an association that in the same year published the first version of the standard called PCI DSS – Payment Card Industry Data Security Standard.

The PCI DSS standard first defined the most important security aspects only for individual participants in the card system, to eventually include all participants (acceptors, issuers, processors, merchants, and all other service providers) and security aspects (PIN, payment card identification data, data transmission channels, secure data storage, secure data access, etc.).

At present, the global card systems prescribe the mandatory implementation of the PCI DSS standard for all participants in the system without exception. However, the method of compliance testing depends on the size of the participant, in terms of the transactions volume of the participant – for participants with low volumes, a self-assessment questionnaire (SAQ) is sufficient, for participants with medium volumes, a Qualified Security Assessor (QSA) is required, while for participants with high volumes, an appropriate Internal Security Assessor (ISA) is required. Compliance testing is performed regularly, annually or quarterly, depending on the type of request.

The technical requirements of the PCI DSS standard are divided into six groups:

1. Security of data and system transfer network
2. Security of payment card and cardholder data
3. System vulnerability management
4. Strong access control implementation
5. Regular monitoring and testing of the security of data transfer network
6. Maintaining information security policy

Each of these groups of requirements is divided into subgroups that cover different aspects of data protection for different participants in the system.

PCI DSS standards definitely provide a very high level of data security for all card system participants. However, they also require significant additional costs related to implementation and regular compliance assessments, which is probably a major obstacle for many potential system participants. However, given such a broad obligation of compliance for all participants in the system without exception, it is only logical that massification could lead to a reduction in costs per participant. Unfortunately, the costs of implementation and regular compliance checks are still high, which for now favours larger participants over smaller ones.

8 Expansion of debit payment card use as a consequence of the 2007–2008 global economic crisis

Until the outbreak of the global economic crisis of 2007–2008, credit cards were predominantly used in developed countries, primarily due to the numerous benefits they offered. In addition to favourable credit lines, credit cards were used without restrictions in all types of payments, which was not the case with debit cards that were linked to current accounts and limited by the current account balance, which resulted in additional restrictions in certain types of payments.

It is interesting that, until 2007–2008, card not present payments such as online payments, telephone or email orders were very often not possible for debit payment cards. The reason for this was the very complicated and time-consuming procedure in case of fraud, which was not problematic for credit cards (because the user still had enough funds available due to high credit limits), but it was problematic for debit cards (because the limit is linked to the current account balance, which is much lower than the credit limit, so the user has significantly less funds at his disposal, until the end of the complaint procedure due to fraud). For these reasons, credit cards have long been used for online payments without any additional security (authentication), since in this type of payment, according to the card systems rules, responsibility predominantly rests with merchants. Therefore, in cases of fraud, after the completion of the complaint procedure, as a rule, the cardholder gets back his funds on the credit account.

It is known that the cause behind the global economic crisis in 2007–2008 was primarily the granting of insufficiently controlled loans and credits, which over time resulted in the so-called “bursting of the bubble” first in the United States, and then consequently in the rest of the world. Although this was primarily related to the real estate market, the practice of insufficiently controlled loans was also present in credit lines linked to credit cards. Namely, unlike the previous period when the monthly repayment of the remaining debt on credit cards was usually at 10–15%, that level fell to only 2–3% in 2007–2008, which drastically extended the repayment of debt (from 1–2 years to as many as 5–7 years), and thus drastically increased cardholders’ total debt under interests (from 15–20% to as much as 100–150%).

The described bad experiences of credit card users, as well as the deteriorating global economic situation, led to a massive shift from credit cards to debit cards, which was induced by both card users and issuers. However, in these new circumstances, the previous restrictions on the use of debit cards (such as disabled online payments) were no longer acceptable, which led to the accelerated development of solutions to those restrictions. It can be considered that this situation also contributed to the accelerated development of solutions for more secure online payments, along with the expansion of the use of debit cards.

9 National card systems as a growing trend

The first national card systems emerged in parallel with today’s global card systems such as Visa and MasterCard. The first ever was French Carte Bleue established in 1967, with the European Eurocheque following soon in the same year, with its own variant of a payment card

– the Eurocheque guarantee card. However, the Eurocheque system turned out too expensive for merchants, offering lower quality technical solutions compared to the ever-growing Visa and MasterCard, so Eurocheque cards were less and less accepted by merchants, which finally led to the system closing in 2001. The Eurocheque cards had been predominantly used in Germany, so they continued to be used in that country under a new name EC (Electronic Cash), while being replaced by MasterCard-owned Maestro cards in the rest of Europe. This situation led to the emergence of the German national payment card Girocard in 2007.

Hence, the first national cards systems were established mainly in developed countries, initially with the intention to keep up with the existing systems or even take the lead in payment card development (e.g. French Carte Bleue), and in some cases also in response to the weaknesses of existing card systems and the need to become independent from them (e.g. German Girocard). It can be said that the first national card systems reflected the aspiration for faster development and competitiveness, rather than mere necessity.

The new national card systems emerging with time have been more driven by necessity than by faster development and competitiveness. Namely, the rapid spreading of global card systems Visa and MasterCard strengthened their domination, which gradually resulted in substantial cost increase for system participants and full dependence on those systems in the markets which had no alternative solutions. This problem was first identified in developed economies, only to soon become widely recognised. Such situation was a trigger for the emergence of more and more national card systems worldwide, which remains the current trend.

The fact that generally around 95% of all card transactions are realised in the country and only 5% as international transactions speaks further in favour of national card systems development. Hence, there is a growing number of countries in which national payment cards are being more used than those of global brands.

Table 1 Overview of national card systems dominant in local markets

Country	Name of the card system	Characteristics
GERMANY	Girocard	90 mn cards issued
FRANCE	Cartes Bancaires	64.5 mn cards issued, 83% of all cards
DENMARK	Dankort	84% share in the turnover
SPAIN	ServiRed, Sistema 4B, Euro 6000	Over 70 mn cards issued
ITALY	Carta Si, PagoBancomat	-
NORWAY	Bank Asept	7 mn cards issued
BELGIUM	Bancontact	15.7 mn cards issued
BELARUS	BelCard	5 mn cards issued
JAPAN	JCB	77 mn cards issued
CHINA	UnionPay	6 bn cards issued, 100% share in the turnover in the country
SOUTH KOREA	BC Card	52 mn cards issued
SAUDI ARABIA	SPAN	100% share in the turnover in the country
AUSTRALIA	eftpos	70% debit card transactions in the country
NEW ZEALAND	eftpos	60% transactions on POS terminals
CANADA	Interac	-

Source: Websites of selected central banks and national card systems.

Table 2 Overview of national card systems established in the last ten years

Country	Name of the card system	Characteristics
BRASIL	ELO	Launched in 2011
INDIA	RuPay	Launched in 2012
RUSSIA	Мир	Launched in 2014
TURKEY	Troy	Launched in 2016

Source: Websites of selected central banks and national card systems.

The number of new national card systems is evidently on the rise worldwide and this trend is likely to continue.

10 Countries as regulators and factors of payment cards development

It is well known that one of the cornerstones of the modern global economy is the free market principle, which should also be the dominant factor of development. However, markets occasionally experience smaller or lesser disturbances, of shorter or longer duration. In situations of extended disturbances, it is only natural and logical that the state should take a more active role in addressing the problem, primarily via the legislation. Such examples can also be found in the payment cards area.

The first payment card-related problems in the market date back to early 1970s, mostly in connection to litigations between merchants and global card systems Visa, MasterCard and American Express.

Already at their onset, card schemes Visa and MasterCard imposed a disputable rule that issuing banks must choose whose cards they are going to issue. After banks' appeals to the U.S. Department of Justice, which were upheld based on the existing antitrust legislation, Visa and MasterCard card schemes were forced to lift this rule and allow banks to simultaneously issue both types of cards.

In the 1990s, Visa and MasterCard card schemes set a new disputable rule preventing the banks issuers of their cards from simultaneous issuing of other cards such as Discover and American Express. The case ended up in the US court in 2001 and the rule was found to have seriously jeopardised the principles of healthy competition and ordered to be abolished.

Simultaneously with the above-described case, in the 1990s large US merchants initiated another court case related to the Visa and MasterCard rule on obligation to accept all types of cards, since credit card acceptance was much costlier for merchants than the acceptance of debit cards. The outcome of this court process was the negotiation with the card schemes to abolish the rule, so that the merchants are free to choose which types of cards they are going to accept.

The period since 2000 has seen dozens of various litigations between merchants and global cards schemes Visa, MasterCard and American Express, primarily related to high multilateral interchange fees which negatively affected merchant costs and final sale prices. These court litigations were conducted also outside the US (e.g. in the European Union and UK), but in most cases without final rulings, as almost all rulings were either cancelled at higher courts or

returned for retrial. The reason for this situation most probably lies in extreme complexity of these issues and a large number of separate cases without a single and consolidated approach.

After years of analyses, consultations, discussions and court cases related to high multilateral interchange fees, in 2011 the US Fed adopted the so-called Regulation II (Debit Card Interchange Fees and Routing). This regulation pertains to debit cards only and caps the debit card interchange fee at 21 cents plus 0.05% of the transaction. Exempt from this rule are “small merchants” who are separately defined in the Regulation.

Several years later, in 2015, the European Union (EU) adopted the Interchange Fee Regulation solving this problem in the EU, by strictly defining caps on interchange fees for debit (0.2%) and credit (0.3%) cards. The Regulation further allowed merchants to choose which cards to accept and forbade the equalisation of final merchant fees in cases where different interchange fees are applied for different cards (unblending).

A similar, though somewhat different approach to regulating interchange fees was applied by Australia, which as early as 2003 introduced periodical, the so called benchmark analyses of the current levels of interchange fees, based on which it initially issued suggestions for their independent updating by card brands and later introduced mandatory caps for interchange fees, updated on as needed basis informed by periodical benchmark analyses, as defined by the Interchange Standard for the EFTPOS System, a part of the Payment Systems Act (Section 18). The current maximum interchange fee for credit cards is 0.8%, and for debit cards – 15 cents if defined as a fixed amount or 0.2% if expressed as a percentage.

For the sake of better regulation of payment systems, in 2007 the EU adopted the Payment Services Directive (PSD) which was transposed by end-2009 into laws of all EU countries. In this Directive, payment cards are mentioned as one among numerous payment instruments.

A few years later, in 2015, the EU issued the Revised Directive on Payment Services (PSD2) with a view to regulating safer and more innovative payment systems. Additions related mostly to better regulation of Account Information Services (AIS), and safer payment card use, by introducing mandatory Strong Customer Authentication (SCA). The concept of strong customer authentication assumes the so called two-factor authentication i.e. simultaneous application of minimum two out of three authentication mechanisms: something the user knows (e.g. a permanent password), something the user has (e.g. a token or a mobile phone) and something the user is (e.g. a fingerprint, a face photo, an iris scan etc.). The strong authentication concept is typically associated with online card payments, though in the Directive it actually pertains to all types of card payments (with few exceptions for smaller transaction amounts), which indirectly also means the obligation to use chip cards (as something the user has). Market responses to the PSD2 and mandatory two-factor authentication were initially predominantly negative, primarily as it assumed investments and short implementation deadlines, but soon thereafter the market witnessed novel solutions which, apart from meeting the new requirements, also offered more comfortable and simpler technical solutions for users so it may be said that after initial problems, the Directive did after all bring higher security and more innovative and comfortable solutions for users.

11 Payment card development trends in Serbia

As in many other countries, the use of payment cards in former Yugoslavia began in 1980s, with payment cards of global card systems. Initially, those were predominantly Visa and Diners cards. After the imposing of sanctions toward FR Yugoslavia in 1992, one of the direct consequences were the problems in using the cards of global card systems. Seeking to overcome this problem, domestic banks launched a domestic YUBA card in 1996.

Following the breakdown of Yugoslavia and the lifting of sanctions in 2000, payment cards of the global card systems were reintroduced in parallel with the use of the domestic YUBA card. However, at that time payment cards were underdeveloped and insufficiently used and the situation was much worse even compared to the period before sanctions. According to some data, the number of payment card users was twice higher in 1992 than after 2000.

Given a rather unfavourable situation with payment cards at that time, the lack of viable technical solutions of the domestic YUBA card and absence of any development in the area, in 2003 the National Bank of Serbia launched the national DinaCard project aiming to speed up the development of this payment area.

Within merely a few years, the national DinaCard project gave a significant boost to development of payment cards in the country, not only DinaCard, but also Visa, MasterCard, Diners and American Express. The total number of cards rose from few hundreds to several million, the number of POS terminals from several thousand to tens of thousands, while ATMs which numbered in dozens grew to several thousand. Under the influence of a new competitive DinaCard and new regulations of the National Bank of Serbia, the costs borne by the participants of the payment card system were significantly reduced, primarily merchant fees and costs of card users.

After the initial success, the national DinaCard project encountered many challenges, typical for all national card systems. In the first place, it is the extremely strong competition of global card systems, mainly in terms of pretty aggressive marketing and pressure on system participants (primarily banks and then merchants as well), and later also in terms of the quick introduction of novel technological solutions which bring progress as well as advantages over the domestic system, where the implementation of new technological solutions is typically slower.

New problems facing the national DinaCard project are of a completely different nature compared to the initial ones, so they may be viewed as additional drivers of further development of card payments in the country. In order to ensure further competitive influence on the domestic payment card market, the National Bank of Serbia and DinaCard system keep abreast of global card development trends, seeking to replicate in Serbia both new technological solutions and legal regulations.

In order to transpose PSD provisions into the Serbian legislation, in 2014 the National Bank of Serbia adopted the Law on Payment Services. In relation to the EU Interchange Fee Regulation, in 2018 the National Bank of Serbia adopted the Law on Multilateral Interchange Fees and Special Operating Rules for Card-Based Payment Transactions. These laws

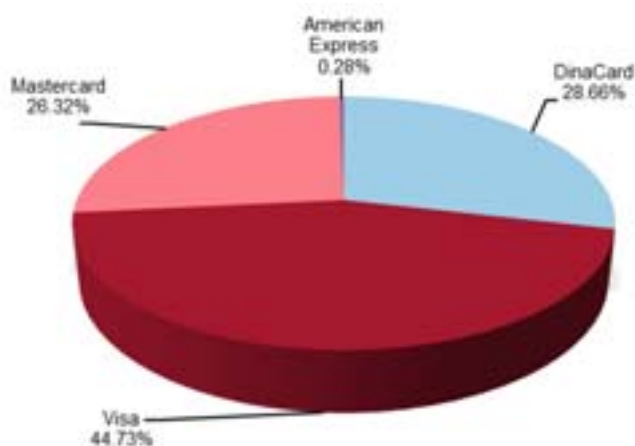
consistently implement the provisions of EU directives into the Serbian legislation, as part of Serbia's EU accession.

Speaking of the latest trends of technological development of payment cards in Serbia, it can be said that all global trends are present in Serbia as well. Expectedly, regarding new technological solutions, global card systems are dominant, mainly Visa and MasterCard, and they may be even stronger here with their implementation compared to other markets, owing to the strong competition from the domestic DinaCard. On the other hand, the DinaCard system continuously keeps pace with the new technological trends in order to maintain healthy competition and positively impact the development.

In 2010, the DinaCard initiated cooperation with the Discover system resulting in a joint DinaCard-Discover payment card, which can be used abroad in global Discover, DCI and Pulse networks. In 2018 the DinaCard established cooperation with the Union Pay International, leading to the acceptance of China Union Pay cards in Serbia, with a joint card soon to follow – DinaCard-UPI acceptable internationally in the global Union Pay International network. As of 2019 all newly issued DinaCards have been chip-based and DinaCard contactless cards will soon be issued. Compared to several years ago, the number of online card transactions has also increased multiple times.

While in many countries the national card system is dominant compared to other card systems, this is not the case in Serbia. The goal of the National Bank of Serbia, in introducing the DinaCard system and additional legislation, was not to suppress global card systems in the country, but to restore a healthy competition and remove the existing problems in the market. That this goal was accomplished is demonstrated also by a rather equitable distribution of market shares of large card systems in Serbia, presented below.

Chart 1 Distribution of the shares of big card systems in Serbia in 2020



Source: NBS.

12 Conclusion

Due to the multidisciplinary nature of this area, global payment card development trends are affected by a number of factors which are not exclusively technological in nature. Very often these include market, legal, financial, social and even political factors. Due to the unrelenting strong competition in the global payment card market, there are constant challenges in the area, both in terms of new business and technological services and solutions and issues undermining healthy competition. Two dominant courses of action in addressing the existing global challenges are new technological and legislative solutions.

The key word for addressing many existing and future problems in this area is – finding the right balance. The cause to the majority of problems is a disturbed market balance, which sooner or later forces the regulator to take action. It is very important that the regulatory action is also adequately calibrated, in order to preserve the free market principles, while at the same time correcting negative phenomena, which in most cases is not an easy task.

Speaking of smaller participants in the payment card market, primarily local and national card systems, they suffer from a chronic inferiority compared to the global card systems. Global card systems are, on the one hand, the main drivers of market development, but due to their dominance they tend, intentionally or unintentionally, to impose technological solutions, costs and rules. Therefore, the competition in the form of local and national card systems and occasional legal interventions are of great importance for regulating the payment card market.

References

- EMVCo LLC, 2014, “A Guide to EMV Chip Technology, version 2.0”,
<https://www.emvco.com/>
- Thales Digital Identity and Security, 2021, <https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics>
- EMVCo LLC, Jun 2021, EMV Secure Remote Commerce Specifications, v1.0,
<https://www.emvco.com/emv-technologies/src/>
- PCI DSS Compliance Guide, 2021, <https://www.pcicomplianceguide.org>
- PCI DSS DOCUMENT LIBRARY, 2021,
https://www.pcisecuritystandards.org/document_library
- Interchange Fee Regulation (IFR), 2015, Regulation (EU) 2015/751 of the European Parliament and of the Council
- Revised Directive on Payment Services (PSD2), 2015, DIRECTIVE (EU) 2015/2366
- Reserve Bank of Australia, 2012, Interchange Fees in the EFTPOS System
- Law on Payment Services, 2018, “RS Official Gazette”, Nos 139/2014 and 44/2018
- Law on Multilateral Interchange Fees and Special Operating Rules for Card-based Payment Transactions, 2018, “RS Official Gazette”, No 44/2018