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# Determinants of success of mobile payments as innovations: An exploratory study based on the extant literature, the M-Pesa, Alipay, and Nubank cases, and the opinion of experts

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**Abstract**

An important fact related to mobile payments is that adopters have already reached the majority group in more than 40 countries. Despite the growth of mobile payments, only a small portion of the related literature has focused on the topic from an organizational point of view. To fill this gap, this paper seeks to identify the main success determinants of firms operating in the segment, looking for relevant characteristics of organizations that are successful in this competitive arena. The investigation carried out a triangulation with the results of a literature review, a case study, and the answers given by a questionnaire applied to a group of specialists from private organizations and the public sector. The results suggest that companies with organic and flexible structures, open communication qualities, and decentralized decision processes increase their chances of success. Furthermore, the results also show that, given non-impeditive regulations, critical mass and the provision of different services other than the payment choice should be considered by firms operating in the mobile payment segment.

**Keywords** Mobile payment, Innovation, Payment instrument, Financial intermediation

**JEL Classification** O31, O32, M13

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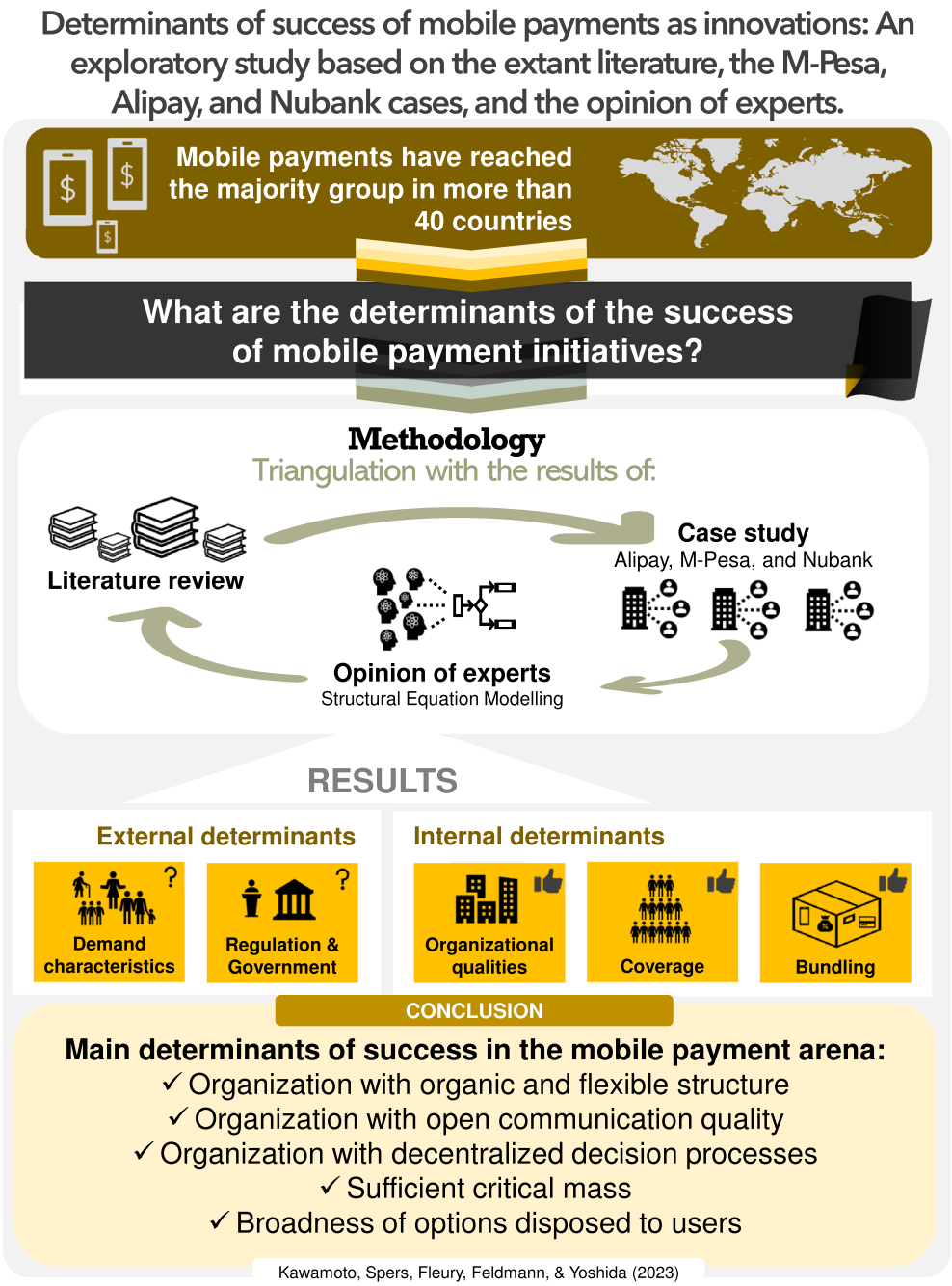
**Graphical Abstract**




## Introduction

Mobile payments have grown vigorously in the past ten years. In 2017, above 16% of the population in 42 nations were using cell phones and other mobile devices to pay school fees and service bills, make domestic transfers, and receive wages [27]. This percentage is a milestone in Rogers' diffusion model [76], suggesting that mobile payments have reached early majority adopters, going beyond its infancy with early adopters. It represents that mobile payments are not a mere promising and exciting domain, but a reality to be further studied [44].

Mobile payments may become more prominent in the near future. As the COVID-19 pandemic has exacerbated the concern that paper banknotes can be an important vector in the transmission of viruses [8, 90], it will not come as a surprise if one sees a further push on the use of cell phones as a payment instrument. Especially in an unstable economic environment, as emphasized by Abbas, Zhang, Hussain, Akram, Afaq, and Shad [1], innovations, such as mobile payments, have become drivers for business firms seeking to build a knowledge-friendly strategy. Furthermore, mobile payments can be directly linked to Sustainable Development Goals #1 and #9 (i.e. no poverty, and industry, innovation and infrastructure), increasing access to financial services and fostering entrepreneurship and technological innovation, which creates job opportunities and improves the skills of labour force [36].

Amongst the nations that are frontrunners on the use of cell phones or other mobile devices as a payment instrument, Kenya, China, and Brazil stand out, together with the Nordic countries where smartphone ownership is close to 100% [72]. The success of Kenya in mobile payments comes from M-Pesa, a service created by the telecommunication company Vodafone and launched in 2007 by its associate Safaricom. In 2017, M-Pesa had already consolidated itself with annual transactions equivalent to 50% of the country's GDP, being used by more than three-fourths of the Kenyan population [79].

China brings the gigantism of its market and the use and development of new technologies, coupled with the penetration of Ant Financial and Tencent—the parent companies of Alipay and TenPay which accounted for more than 90% share of mobile payments in China in 2018 [95]. These two Chinese initiatives are responsible for managing, only domestically, more than one billion user accounts, transacting 29 trillion dollars in 2018 [40, 51].

In Brazil, mobile payments have taken off only recently, at least compared to Kenya and China. The Brazilian Nubank case has erected itself as a successful initiative that deserves to be mentioned. In the country, e-money accounts operated by non-bank institutions such as Nubank's NuConta have begun to compete in the mobile payment arena, going beyond online credit card payments. After the launch of Pix in 2018, a system created and operated by the Central Bank of Brazil that allows instant payments and cash transfers with smartphones, it became possible to transfer money from a Nubank account to other users' accounts outside Nubank's systems, increasing the benefits to Nubank's clients. In 2021, Nubank's IPO reached a USD 41 billion valuation, higher than the country's largest bank.

Despite the evolution of the literature related to payment innovations, only a small part of it has focused on the use of mobile payments in retail transactions from an organizational point of view. The most common strand investigates individual behaviour and attitudes towards a specific aspect of mobile devices, using Davis's [26] Technology Acceptance Model (TAM) or latter advancement approaches (e.g. [6, 12, 23, 63, 67, 81, 89, 96], and [5]). Generally, the results suggest that social influence is a determinant of the intention to use or recommend mobile payment systems, along with the perceived relative advantage of the cell phone and its ease of use. Nevertheless, related papers rarely focus on internal organizational qualities or other external factors that explain successful initiatives.

Mobile payment technology innovations around the globe have different characteristics and attributes, strengthening the argument for the nonexistence of a single theory to explain the phenomenon. This approach can be associated with authors such as Lawrence and Lorsch [54], Luthans and Stewart [59], and Drazin and Van de Vem [31], who suggest that there is no particular way to manage organizations towards innovation without considering the possibility of different market structures or environments. Similarly, Liu, Kaufmann, and Ma's [55] technology ecosystem and path of influence perspective considered as important forces that explain the evolution of mobile payments not only the supply-side drivers for innovation but market-side competition, cooperation, and regulation among stakeholders in financial services. Additionally, it is reasonable to accept that some attributes describing mobile payment as an innovation are secondary, meaning that they can be framed in different ways according to the observer, reinforcing the idea of determinants conditioning innovation types, as advocated by Downs Jr. and Mohr [30], leading to a contingent approach.

Accordingly, this paper seeks to identify and discuss on determinants of innovative firms in the mobile payments segment. Based on a literature review, the prominent cases of Alipay, M-Pesa, and Nubank, and the opinions of specialists, this study selected and analysed the major forces contributing to the expansion of mobile payment initiatives, suggesting a strategic focus to managers and practitioners. Its main contribution is to add a different perspective to the analyses of the mobile payments segment, away from the usual assessment of individual behaviour and attitudes towards a specific aspect of mobile devices.

To accomplish its main goal, the paper is divided into five sections including this introduction. The second section present a brief history of mobile payment and explores the main concepts related to the subject,

establishing common ground for the discussion that follows. The third section explains the methodological approach applied in the investigation. The fourth section explores and analyses the information and data collected, selecting the main determinants. The fifth section brings forward concluding remarks, with the implications of the results. It also gives some policy recommendations and suggestions for future studies.

## Literature review and concepts

### Brief history of retail mobile payment

The financial services industry has been offering several innovative ways to provide alternatives to cash and coin payments. Since the Renaissance when the privatization of the issuance and distribution of cash by commercial banks was a convenient solution for public financing, banknotes have shown evolution and innovation not only in their distribution systems but also in their production technology, including the application of serial numbering on notes and printing on polymer.

After hundreds of years of the presence of cash and coins as we know them today, the credit card has become a well-established alternative, at least since the 1940s when the idea of the contemporary credit card emerged in the USA. In 1946, the National Bank of Brooklyn, New York, issued a "Charge-It" card program between customers and local merchants that allowed the latter to deposit sales slips into the bank and the bank billed the former [11].

Above all, the credit card is now firmly established as an option to cash and coins, but other alternatives have been presented, especially for electronic markets that were created after the launch of the commercial internet in the 1980s. Since the emergence of e-business in the 1990s, payment technologies have undergone an intense period of experimentation.

In fact, since the flourishing of e-commerce, electronic payments have evolved pari passu as a necessity, simply because cash and coins were not options in the new marketplace. Different solutions have been created to ease financial transactions between end consumers and suppliers of goods and services. There has been increasing expertise in data transmission technologies, network management, and security systems through the creation of specific segmentations in a rapidly expanding ecosystem, with companies revealing different innovations and demanding new competencies and skills from their labour force. In this evolutionary process, credit cards were electronically enabled and more securely provided, allowing direct access to users' accounts through the internet.

The advance of mobile devices allowed the migration of a substantial part of e-commerce from personal computers (PC) to cell phones, which were more convenient and accessible [92], promoting the advent of so-called m-commerce (mobile commerce) and m-payment (mobile payment). Okazaki [66] brought that m-commerce typically takes place in a platform called a "mobile portal", being distinct from a PC-based electronic commerce.

Mobile payments have emerged along with the first offers of services on cell phones such as ringtones, games, and other electronic services, being considered a technological innovation in mobile financial services [65]. According to Dahlberg, Guo, and Ondrus [21], the experimental case of selling Coca-Cola in vending machines through SMS messages in Finland in 1997 is considered the first mobile payment initiative. A further look at some of the most famous initiatives in the mobile payment arena can be found in Liu, Kaufmann, and Ma [55]. As the historical experience teaches us, cell phones have been positioning themselves as important tools for payments not only in the virtual environment but also in physical stores.

### Concepts of mobile payment

According to Karnouskos [44], "any payment where a mobile device is used in order to initiate, activate, and/or confirm this payment can be considered a mobile payment" (p. 44). This concept comprises payment services offered online or offline, representing a digital financial transaction. An important feature of this concept is that mobile payments can be performed both to settle transactions in electronic commerce, mobile commerce, and physical stores, as long as they are carried out with mobile devices. Karnouskos's [44] definition is close to Apanasevic et al. [7] concept, for whom mobile payments are "payments implemented using a mobile phone as an instrument for retailers" (p. 38), but excludes additional services generally provided by banks such as credit provision (i.e. mobile banking). Koenig-Lewis, Marquet, Palmer, and Zhao [53] gave a similar interpretation to the concept of mobile payment, excluding from its scope mobile banking and other mobile services such as mobile ordering and mobile delivery.

It is important to highlight that although mobile payments are usually associated with mobile wallets such as Apple Pay, Samsung Pay, and Google Pay—which use incorporated data transmission technologies such as near-field communication (NFC) or magnetic secure transmission (MST) and enable users of credit or debit cards to make payments in physical environments with their cell phones—other technological models such as the QR code used by the Chinese Alipay or Pix in Brazil also provide access to payments and money transfers using mobile devices.

Furthermore, Liu et al. [55] emphasized that the history of mobile payments suggests almost all of the initiatives in the 2000s failed. According to the authors, payments standard competition between online independent payment service providers (e.g. Alipay and PayPal) and the new technology platforms (e.g. Google Wallet and Apple Pay) created uncertainties for stakeholders' adoption decisions and network formation, which has slowed down the pace of mobile payment services innovations. We agree with their point of view because the development of mobile payments in Kenya, China, and Brazil has shown that digital convergence is not necessarily widespread in the globe. But, we emphasize that the mobile payment growth is limited within geographic domains, being dependent on the sociodemographic characteristics of the population, infrastructure, and regulation direction given by authorities.

With these considerations in mind, the concept of mobile payment adopted in this study is similar to Karnouskos's [44] and Koenig-Lewis et al. [53], comprising any cash withdrawn, payment or money transfer where a mobile device is used online or offline to initiate, activate, and confirm this cash withdrawn, payment, or transfer.

## Data and methodology

This is an exploratory-descriptive study with a research strategy designed to identify and select the main determinants of the success of mobile payments. We started examining the literature with focus on innovation determinants to sort potential factors associated with mobile payment instruments. We searched major database sources such as Scopus, Web of science, and Google Scholar. We selected and analysed more than 110 papers, not all cited in this text.

After the literature review, we analyse the selected cases, i.e. Alipay, M-Pesa, and Nubank. The selection was not random. On the contrary, they were chosen amongst successful initiatives in the mobile payment industry under different institutional and organizational contexts. Furthermore, the cases did not involve, at least domestically, competing organizations.

We considered several sources of information such as newspapers, magazines, specialized websites, and academic publications. In addition, we interviewed corporate executives, former employees, and industry experts in Kenya, China, and Brazil. Furthermore, it was also possible to experiment with the services as customers, along with observing and collecting information from other users.

The interviews with executives were semi-structured, and the interviewees' opinions regarding the determinants of the success of each initiative served as guidelines for each conversation. Moreover, open-ended questions were asked to incorporate other elements during the meetings. In addition to the face-to-face interviews conducted in the second half of 2018 in the headquarters city of each organization during a single meeting of 50 min on average, other published interviews with executives were used as secondary sources of information. Table 1 presents a list of interviews considered in the analysis.

Further we ran a questionnaire with a group of experts in mobile payments with experience in private companies and regulatory entities.

The questionnaire comprises 13 questions related to potential determinants for the success and development of mobile payment instruments. The questionnaires were submitted to respondents through an electronic platform (website), or handed out in paper form, or sent by email. The universe of subjects formed a total of 113 senior experts from private organizations belonging to the payment instrument ecosystem, and regulatory or supervisory entities, with at least 3 years of experience in mobile payments. We collected 43 completed questionnaires satisfactorily answered (38% response rate), with 24 respondents from the private sector and 19 from the public sector. The questionnaire and the data that support the findings of this study are available from the corresponding author upon reasonable request.

The following paragraphs describe a little further the methodological procedures applied to the case study analysis and the expert questionnaire.

## Case studies

The analytical procedures began after the collection of organizational and environmental data for each case and subsequent systematization to generate a broad perspective regarding important factors that could potentially explain the success of each initiative.

**Table 1** Interviews considered in the analysis

| Code | Position | Organization | Date | Source |
|---|---|---|---|---|
| SAF1 | CEO | Safaricom | November, 2012 | Secondary |
| SAF2 | Director | Safaricom | May, 2017 | Secondary |
| SAF3 | Manager | Safaricom | September, 2018 | Primary |
| SAF4 | CEO | Safaricom | November, 2018 | Secondary |
| ALI1 | Founder | Ant Financial | January, 2018 | Secondary |
| ALI2 | Manager | Ant Financial | October, 2018 | Primary |
| NUB1 | Founder | Nubank | August, 2017 | Secondary |
| NUB2 | Founder | Nubank | November, 2017 | Secondary |

One challenge imposed to the case study is that innovations have multiple perspectives. Therefore, one must choose a unit of analysis to the study that suits this feature. We employed a multiple unit of analysis approach, which is unusual in case study analysis but has been previously used [71]. Furthermore, we employed a multiple case study approach [20, 97], focusing on organizational and environmental determinants of the success of the selected initiatives.

Furthermore, even though the number of cases is lower than suggested by Eisenhardt [32] and no one denies the existence of other successful cases such as Paytm from India, WeChat from China, or Swish from Sweden, amongst further international initiatives, the selected cases distinguish themselves for at least three reasons. Firstly, they were successful innovations that defied existing payment instruments such as paper banknotes or plastic cards. Secondly, they operated under different technologies, which could be convenient to explore in a study that looks for success determinants of organizations with diverse backgrounds. Thirdly, and above all, they presented sufficient data to be considered in the analysis.

The data and information from the three cases were compared qualitatively, aiming to find coincident factors in the evaluated initiatives. Unlike the contemporary stream in the literature that employs content analysis and enables the quantification of discourses [71], the examination of the interviews was also qualitative.

### Expert opinion

The answers from the expert opinion questionnaire were analysed using structural equation modelling (SEM) with estimates and diagrams performed with the Stata 14 software.

After the selection of the relevant questions and factors, the analysis was carried on by the estimations of a conceptual model, where the first twelve questions were associated with external or internal characteristics of organizations and related to one of the five factors of the proposed model, i.e. 'demand characteristics', 'regulation and government', 'organizational qualities', 'coverage', and 'bundling'.

Due to its symbolism and representation of complex phenomena in an intelligible, simple, and versatile manner, path diagrams were applied [64]. For this study, the diagram representing the conceptual model to be tested is presented in Fig. 1, where the answers from questions $Q_1$ to $Q_{12}$ are associated with potential determinants and $Q_{13A}$ and $Q_{13B}$ are used as independent variables.

## Results and discussion

We now present the main results of the analyses, starting with the literature review. The case study follows and the section ends with the analysis of the questionnaire answered by specialists.

### Analysis of the literature

Innovations have different dimensions and are influenced by social, economic, technological, and cultural factors [16, 62, 76]. External factors can play important roles in the success of mobile payment initiatives [55], but internal qualities of the organization responsible for the innovation play a fundamental role [22, 23]. While only a limited number of studies from the universe of the innovation literature have addressed mobile payment initiatives, it is realistic to say that organizational qualities are of fundamental importance to grow in the mobile payments segment. To substantiate this conjecture and select the determinants of mobile payment initiatives already discussed in the related literature, we present a synthesis of the main findings in the following paragraphs:

### Demand characteristics

Consumers' income and wealth are among the external factors most discussed in the literature that evaluates mobile payment instruments (e.g. [12, 50, 60, 67]. There is sufficient evidence that rich individuals adopt new payment technologies more frequently than those who are less financially fortunate. In the same line, Kawamoto [46] showed that sociodemographic factors can influence the choice of the cash option. Accordingly, it seems reasonable to accept that the level of income or wealth is more relevant when there is an absence of a dominant design [2], as is the case with mobile payment, which have suffered from the absence of a standard since their inception. Accordingly, one may see rich early adopters of mobile payments rather than poor ones.

In another strand of the literature, some focus on product characteristics, seeking to assess individual behaviours and attitudes towards specific technologies. Several studies have used Davis's [26] TAM or later evolutions [93] with a perspective on the mobile payment ecosystem, as in Bouwman, Carlsson, Molina-Castillo, and Walden [12, 23]; Schierz et al. [81], Yang, Lu, Gupta, Cao, and Zhang [96], Thakur [89], Mohammadi [63],Koenig-Lewis, Marquet, Palmer, & Zhao [53],Oliveira et al. [67],Su, Wang, and Yan [86],Liu, Wang, and Huang [56], Al-Qudah, Al-Okaily, Alqudah and Ghazlat [6],and Alkhwaldi, Alharasis, Shehadeh, Abu-AlSondos, Oudat, and Bani Atta [5]. Generally, the results suggest that social influence is a key determinant of the intention to use or

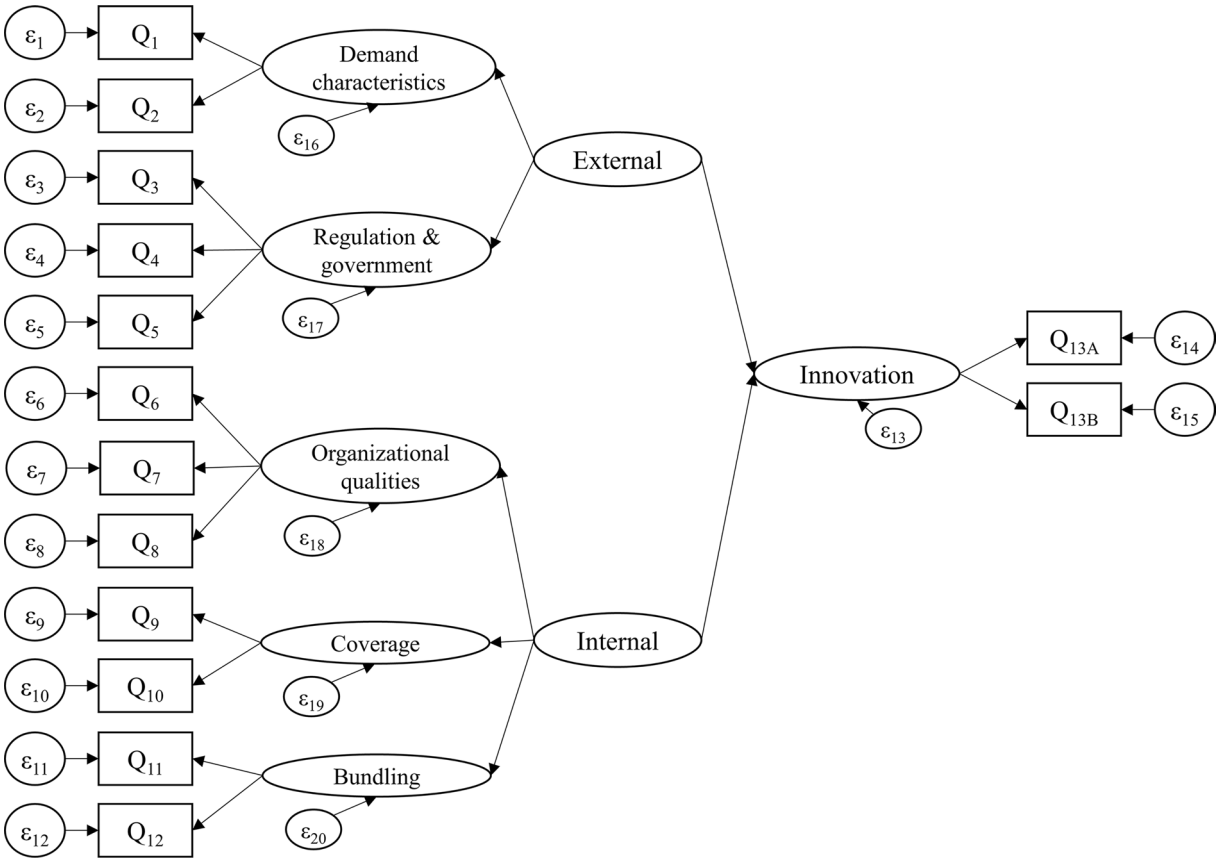



**Fig. 1** Conceptual model. *Source*: authors

recommend mobile payment systems, along with the perceived relative advantage of the instrument and its ease of use.

Based on Diffusion of Innovation (DOI) Theory, Wang [94] explored the effects of customer-perceived utilitarian and hedonic value on the use of mobile payment, finding that complexity—which has been defined as the degree an innovation is seen as difficult to realize or operate—had a negative influence on mobile payment continuance intention.

Other studies compare the attitudes of the populations of different countries or regions towards new technologies, especially based on Rogers' model [76]. For example, Fennel [35],Takada and Jain [87], Tellis, Stremersch, and Yin [88], Bech and Hobijn [10], and Damanpour and Schneider [25] suggested that different innovations have different periods of introduction and diffusion among countries, providing a perspective regarding the importance of economic and socio-cultural characteristics for the demand and success of innovations. Again, the wealthier the country, the sooner it adopts payment innovations.

#### Regulation and government

Another often-cited external element that can influence the success of an innovation is the degree of legal or regulatory rigidity imposed over organizations and markets [9, 41, 58, 80].

According to Mantel [60], government involvement in rights, guarantees, consumer protection, and incentives associated with different payment instruments should have significant implications for their provision. Liu et al. [55] emphasized that regulation does not aim to inhibit innovation-spurring competition in the mobile payments arena but instead to "facilitate a more successful payment regime, maintain financial stability, monitor the risks, and build an efficient payment process" (p. 382), bringing to mind the prudential regulation possibility inherent to mobile payments, which are frequently associated with fintechs. Thus, one clear interference concerning government is via prudential regulation and supervision, which create a burden to comply with regulatory requirements, and demand electronic money issuers to hold liquid assets in the form of government bonds or demand deposits at domestic commercial banks [29], reducing the profitability of firms offering such services.

Nevertheless, the effectiveness of government interventions over innovative activities is far from consensual [38] due to the different consequences of quantitative interventions from governments [39], such as grants and subsidies for research and development [47], or the imposition of technological standards or specific quality [61]. Abernathy and Utterback [2], for example, argued that government support "forcing a young industry to standardize its products before a dominant design has been realized" (p. 46) is undesirable because it reduces incentives for radical innovations.

The idea that a non-restrictive regulatory framework is a necessary condition for effectively diffusing new payment instruments is based on the hypothesis that stable and clear norms that do not impede the operation of (or raise barriers to entry in) a sector provide greater certainty for corporate initiatives [9]. On the other hand, the emergence of recent innovations—such as Uber that challenge entry barriers imposed by existing norms, or the Alipay and WeChat cases which operate domestically under a "unique capital structure and state monitored corporate sector" (Liu, Qu, Wang, and Mubeen, 2021)—seems to question the perception that the regulatory environment can generate a significant impact on any phase of the innovation process [69].

In summary, there are many ways in which regulation can be approached. If the associated hypotheses are diverse and complicated, the exploratory nature of this study provides a qualitative and descriptive evaluation that can provide suggestions about the relationship between regulatory frameworks, government actions, and the development of mobile payment instruments.

#### Organizational qualities

In many organizational systems and subsystems, there are different characteristics or organizational qualities associated with innovations. Among them are the homogeneity of human resources, both at top management and lower hierarchical ranks [52, 77], the degree of centralization of decisions [4, 37, 52, 73], the degree of formalization of the processes [16, 73], and the ability of an organization to engage in strategic partnerships [4]. Due to the multiplicity of factors, they are summarized into the smallest possible conceptual group based on Luthans and Stewart's model [59], here called "organizational qualities", encompassing the characteristics of the management and resources of a company that can influence the success of an innovation.

There is sufficient evidence that excessive centralization of decisions [4, 37] and formalization of processes [73] have perverse effects on the innovative process of organizations. While the autonomy of agents or the lack of centralization can amplify creative processes, they can also generate negative effects on the efficiency required for the subsequent stages of innovation. Empirical evidence advocates a net effect reflecting a positive association of decentralization and autonomy with innovation [24, 52]. Furthermore, the same rationale applies to innovations made by subsidiaries or divisions. In this line, organizations should enjoy autonomy in their decision-making processes, either from the parent company if the organization that innovates belongs to some conglomerate or in terms of different divisions within organizations, avoiding replication of standards and processes used in the production of dominant design products for the mainstream market [2].

The hypothesis that a higher level of alliance among companies is a necessary condition for the success of initiatives in the mobile payment arena seems reasonable. An open management approach indicates the degree of cooperation between different organizations in the industry as an important element [17, 33]. The theme seems more fascinating when applied to the actors involved in the mobile payment industry, which forms a large and varied ecosystem. Liu, Kaufmann, and Ma [55], for example, endorsed the market-side competition driver for innovation in mobile payments, emphasizing that cooperation among stakeholders in financial services is an important force that explains the evolution of mobile payments.

Associated with the degree of cooperation among stakeholders in a specific market is the degree of competition, which is frequently cited in studies about innovation [3, 91]. Confronting the conventional wisdom that competitive markets are more innovative, Aghion, Bloom, Blundell, Griffith, and Howitt [3] advocated for an inverted U-shaped curve representing the relationship between innovative activity and the degree of competition. Focussed on instantaneous payment instruments, Hartmann, Hernandez, Plooij, and Vandeweyer [41] stated that this relationship is unclear. Accordingly, the exploratory nature of this study can lead to other perceptions about the theme.

Along with being a new product or service, mobile payment instruments are often considered business model innovations, mainly because of their network nature [68, 83, 84] and the complexity of a platform operation [33, 75]. Therefore, two other factors related to the subsystem of resources and the subsystem of management need to be analysed. In this study, they are referred to as "coverage" and "bundling".

### Coverage

Adhering to Rohlfs's [78] and Schmalensee's [82] idea of two equilibria in network businesses, the coverage concept points to the preference of an antecedent network to initiate a mobile payment business. In other words, coverage is associated with the existence of a sufficiently large network that allows innovation to enjoy economies of scale and consequently competitive pricing. Inspired by Keen [49], Staykova and Damsgaard [84] presented a similar concept called "reach". Two variables associated with the coverage construct are the size of the organization and the existence of sufficient critical mass. If large companies benefit from the presence of established infrastructure or access to financial resources to build a network, fintechs and small enterprises may find barriers to their growth.

Moreover, rather than only being a network business in which the growth of the customer base reduces unit costs and the likelihood of new customers coming in, the two-sided market wherein a mobile payment instrument operates requires coordination of at least two different types of users. In the case of mobile payments, the two sides can be understood as payers and payees (or buyers and sellers). Unlikely in the iconic two-sided market examples of razor and blade or printer and ink cartridge where consumer choice is dependent on the net costs and benefits of purchasing the associated product, in mobile payment platforms consumers do not perceive or internalize the net benefits of their admission into the network [74].

The existence of a minimum critical mass that allows firms benefiting from scale and supply network externalities seems to be an important resource of such platforms [34, 45]. Eisenmann, Parker, and Van Alstyne [33], for example, warned managers about the importance of rapidly gaining mass in an environment of increasing returns to scale.

In a nutshell, coverage requires the availability of sufficient resources to build a broad network of users, which has raised important responses to different types of innovation. For mobile payment instruments, the reach of a large network base seems to be a requirement imposed for their success. While the impact on growth is contingent on the availability of a large pocket with sufficient resources, the variable profitability can be directly impacted by the coverage construct. Finally, as the simplest entry option, i.e. start large, applies to a considerable number of stakeholders in established networks and is potentially embedded in the financial intermediation ecosystem of many countries, it should not be discarded as a superior alternative.

### Bundling

Bundling is a marketing scheme consisting of the sale of two or more separate (often complementary) products or services as a package [85]. It is a well-known pricing strategy that increases profitability or the penetration of platforms [14, 18], and [19]. In the mobile payment segment, bundling strategy refers to the broadness of options disposed to users through a single channel accessed via a mobile device, which increases the network value of this channel.

Staykova and Damsgaard [84] used a similar concept called "range", coined by Weil and Broadbent (2000) which refers to the number of different functionalities of a platform, and presented it as the base of a framework for planning and guiding the expansion of a platform. According to Kazan and Damsgaard [48], "bundling allows platform owners to introduce new technologies, increasing the value proposition, and thus expediting the adoption rate" (p. 11).

Some papers' results endorsed the idea that bundling is an important factor influencing mobile payment adoption. Hasan et al. [42], for example, found that product bundling influenced the adoption of WeChat and Alipay. Staykova and Damsgaard's [84] cases illustrated the importance of the construct. Similarly, all Kazan and Damsgaard's [48] cases increased their value proposition by bundling their existing payment services with other non-payment applications to take new revenue sources.

In conclusion, based on the literature, it is reasonable to accept that mobile payment instruments offering other services to their users apart from providing a payment alternative are more likely to succeed.

### Suggested factors

The factors presented above offered evidence that they perform as determinants in the mobile payment segment, particularly in relation to the success of firms. They are summarized in Table 2, which shows some related references.

### Case studies

The analyses of the cases indicated that a few common external aspects provided an adequate basis for due comparison. China, Kenya, and Brazil have different economies in terms of size and profile of demand and political background. Among the few similarities, regulations did not obstruct the development of mobile payment initiatives. One cited example was the level of reserves for electronic money deposits required by regulators. For M-Pesa, the agreement to deposit the e-float revenues in philanthropic funds softened the requirements of the monetary authority. In China, third-party payment

**Table 2** Selected determinants for analysis. *Source*: Authors

| Factor | Description | Related variables | References |
|---|---|---|---|
| Demand characteristic | Innovative behaviour, wealth, and income of consumers, including the propensity of individuals and organizations to adopt innovations and the availability of access | Rogers' [76] categories<br>Mobile phone penetration<br>Share of remittances in GDP | Kennickell & Kwast [50], Bech & Hobijn [10], Bouwman et al. [12], Schierz [81] |
| Regulation and government | Little restrictive regulation with adequate protection of property rights, and a lesser imposition of barriers to entry | Was there any regulation? If so, was the regulation a harsh one?<br>Was there a governmental incentive to the project?<br>Startup easiness (OECD) | Baer & Pavel [9], Mantel [60], Lumpkin [58] |
| Organizational quality | Quality management dedicated to long-term goals, organic, decentralized, and participatory management; a high level of intra- and inter-firm cooperation | Initiatives undertaken in partnership with another organization<br>Origins of capital<br>Values associated with a long-term vision<br>Concentration of the decision-making process<br>Formalization of processes | Pugh et al. [73], Aiken & Hage [4], Rogers & Shoemaker [77], Kim [52], Sanchez [80], Damanpour & Schneider [25] |
| Coverage | The size of the antecedent network and the volume of resources dedicated to the organization or the innovative initiative that provides sufficient critical mass | Share of antecedent network<br>Asset value<br>Number of employees | Katz & Shapiro [45], Sanchez [80], Staykova & Damsgaard [84] |
| Bundling | Supply of complementary mobile services | Quantity and types of services<br>Banking penetration<br>Credit card penetration | Dahlberg et al. (23, Choi [18], Kazan & Damsgaard [48], Hasan et al. [42] |

providers such as Alipay were required by the People's Bank of China (PBC) in 2018 to keep 50% of customers' deposits in bank accounts bearing no interest (People's Bank of China, 2018). According to the same source, this percentage rose to 100% in January 2019. In Brazil, according to Circular 3705, from the Central Bank of Brazil, payment institutions issuing electronic money should allocate 80% of their balances in government bonds or cash deposits in 2018 [15]. The same way as in China, the percentage in Brazil rose to 100% in January 2019.

Despite the specificities of each case, the ability that the companies demonstrated to grow in a non-existent regulatory environment under construction is worth mentioning. The fear of restrictive regulations was highlighted in interviews [SAF3; ALI1; NUB1; NUB2]. In one situation, the interviewee advocated for a review of the existing regulatory approaches based on traditional organizations [ALI1].

Regarding internal organizational factors, Safaricom, Ant Financial, and Nubank differed in their sizes, strategic profiles, and management characteristics. As a publicly traded mobile telephone network operator subject to many regulatory requirements, Safaricom was the most conservative, especially in the work environment and attitude of its employees. Ant Financial and Nubank had no publicly traded shares until 2020 and were subject to fewer control requirements, maintaining a work environment similar to the fintech archetype [57]. As an anecdote related to the work environment mentioned by interviewees, it is rare to find Ant Financial's or Nubank's employees dressed in suit and tie.

Considering the different origins of those organizations, all cases demonstrated that they were practitioners of open and participative management, which have structures similar to Burns and Stalker's [13] organic type as opposed to a mechanistic one. The following quotation highlights the idea that Safaricom encourages employees' participation:

> *"(...) you can easily walk and reach the managers, unlike other companies where even reaching the manager is a hassle. (...) Safaricom encourages the participation of employees throughout the company." [SAF4]*

We end the analysis of the cases showing Table 3, which summarizes some of the observed elements.

### Expert opinion

The questionnaire sent to experts comprises 13 questions. In the first 12 ones, we sought to capture the perceptions

**Table 3** Characteristics of the cases

| | **Company** | **Safaricom** | **Ant Financial** | **Nubank** |
|---|---|---|---|---|
| | **Country** | **Kenya** | **China** | **Brazil** |
| | **Year** | **2007** | **2011** | **2014** |
| Demand characteristics | Adopter category | Late majority | Early majority | Early majority |
| | Cell phone penetration [a] | Medium (43%) | High (72%) | High (137%) |
| | Remittance (inflows/GDP) | High (2.0%) | Low (0.2%) | Low (0.1%) |
| Regulation and government | Regulation | None | None | Partial |
| | Governmental incentive | External (UK) | Internal | None |
| | Doing Business | good (61/190) | good (46/190) | average (109/190) |
| Management qualities | Origins of capital | Private and public | Private | Private |
| | Structure | Organic | Organic | Organic |
| | Work environment | Formal | Informal | Informal |
| Coverage | Antecedent network | 66% [b] | 58% [c] | None |
| | Employees | > 2300 | > 7000 | < 1100 |
| Bundling | Banking & Payment | Yes | Yes | Yes |
| | Service categories | 2 | 5 | 3 |
| | Credit card penetration | 6% | 8% | 32% |

[a] Percentage in the year of launch; [b] Participation in mobile telephony; [c] Participation in e-commerce (B2C)

of the interviewees about certain elements potentially relevant to the development of mobile payment instruments, on a scale of 1 to 5. The average response was 3.75. In fact, at the significance level of 0.01, only question $Q_4$ related to the importance of government incentives for the development of mobile payment instruments had the equality of distributions between public and private respondents rejected in a Mann–Whitney rank test for a 0.01 significance level. Questions $Q_1$, $Q_6$, $Q_8$, $Q_{10}$, and $Q_{11}$ presented a mean response higher than the overall average of 3.75. These results are presented in Table 4.

A factorial analysis was conducted with standardized data from questions $Q_1$ to $Q_{12}$ as part of the evaluation. The principal components analysis selected four factors by the eigenvalue criterion greater than 1. However, despite Bartlett's sphericity test rejecting the null hypothesis of no correlation between the responses at the 0.05 significance level, the Kaiser–Meyer–Olkin (KMO) test pointed to the statistic of 0.44, which was inferior to the floor of 0.5 suggested in the literature [28]. The anti-image matrix in Table 5 suggests the explanatory power of the factors in each question or variable, mainly through the diagonal of covariance. Considering relevant

**Table 4** Mean responses by the origin of the respondents and order test. *Source*: authors

| **Question [associate variable]** | **Respondent's sector** | | **Full set average** | **Mann–Whitney** | |
|---|---|---|---|---|---|
| | **Private** | **Public** | | **Statistics z** | ***P*-value** |
| $Q_1$ [smartphone penetration] | 4.67 | 4.53 | 4.60 | 0.72 | 0.47 |
| $Q_2$ [people with bank accounts] | 3.50 | 3.32 | 3.42 | 0.41 | 0.69 |
| $Q_3$ [little restrictive regulation] | 3.50 | 3.79 | 3.63 | − 1.04 | 0.30 |
| $Q_4$ [government incentives] | 3.50 | 2.47 | 3.05 | 2.90 | 0.00 |
| $Q_5$ [low regulatory burden] | 3.29 | 3.58 | 3.42 | − 0.81 | 0.42 |
| $Q_6$ [long-term vision] | 4.00 | 3.95 | 3.98 | − 0.05 | 0.96 |
| $Q_7$ [decentralized decision] | 3.79 | 3.16 | 3.51 | 2.01 | 0.04 |
| $Q_8$ [cooperative activity] | 4.08 | 4.00 | 4.05 | 0.34 | 0.73 |
| $Q_9$ [company size] | 2.75 | 2.79 | 2.77 | − 0.38 | 0.71 |
| $Q_{10}$ [economies of scale] | 4.42 | 4.33 | 4.38 | 0.46 | 0.66 |
| $Q_{11}$ [joint service supply] | 4.46 | 4.05 | 4.28 | 1.98 | 0.05 |
| $Q_{12}$ [complementary services] | 3.83 | 3.53 | 3.70 | 1.38 | 0.17 |

**Table 5** Matrix of responses' covariance. *Source*: authors

| | Smartphone penetration | People with bank accounts | Little restrictive regulation | Government incentives | Low regulatory burden | Long-term vision | Decentralized decision | Cooperative activity | Company size | Economies of scale | Joint service supply | Complementary services |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $Q_1$ | $Q_2$ | $Q_3$ | $Q_4$ | $Q_5$ | $Q_6$ | $Q_7$ | $Q_8$ | $Q_9$ | $Q_{10}$ | $Q_{11}$ | $Q_{12}$ |
| $Q_1$ | 0.88 | | | | | | | | | | | |
| $Q_2$ | 0.12 | 0.80 | | | | | | | | | | |
| $Q_3$ | − 0.02 | − 0.05 | 0.49 | | | | | | | | | |
| $Q_4$ | − 0.10 | − 0.17 | 0.15 | 0.58 | | | | | | | | |
| $Q_5$ | − 0.01 | 0.04 | − 0.32 | − 0.13 | 0.43 | | | | | | | |
| $Q_6$ | − 0.06 | − 0.10 | 0.18 | 0.25 | − 0.21 | 0.78 | | | | | | |
| $Q_7$ | 0.10 | − 0.01 | 0.04 | − 0.12 | − 0.08 | − 0.01 | 0.52 | | | | | |
| $Q_8$ | − 0.03 | − 0.07 | − 0.13 | − 0.09 | 0.21 | − 0.11 | − 0.15 | 0.73 | | | | |
| $Q_9$ | 0.05 | − 0.12 | 0.06 | 0.24 | − 0.04 | 0.09 | − 0.19 | 0.01 | 0.69 | | | |
| $Q_{10}$ | − 0.18 | 0.00 | − 0.05 | 0.03 | 0.02 | 0.01 | − 0.19 | − 0.02 | − 0.09 | 0.74 | | |
| $Q_{11}$ | 0.02 | 0.21 | 0.00 | − 0.10 | 0.01 | − 0.08 | − 0.21 | 0.01 | 0.13 | − 0.07 | 0.55 | |
| $Q_{12}$ | 0.16 | 0.00 | 0.04 | − 0.02 | − 0.06 | 0.03 | 0.16 | − 0.18 | − 0.06 | − 0.09 | − 0.19 | 0.81 |

variables such as those with diagonal values greater than 0.5, the results suggested the exclusion of questions $Q_3$ ('restrictive regulation') and $Q_5$ ('low regulatory burden'). One possible explanation for this fact is that the answers to these questions presented low variance and low correlation with other answers. Remarkably, respondents from the public sector disagree with the importance of regulation more than respondents from the private sector, although responses from both groups were statistically equivalents.

The second procedure considered the remaining questions and pointed out only two factors with an eigenvalue criterion superior to 1. The covariance matrix did not suggest the exclusion of additional variables. As some questions may have a low relationship with others, the tests continued to select variables with individual KMO superior to 0.5. Under this criterion, only questions $Q_7$, $Q_8$, $Q_{10}$, and $Q_{11}$ that related to the variables 'decentralized decisions', 'cooperative activities', 'economies of scale', and 'joint service supply' (i.e. bundling), respectively, were maintained for a single factor (bold in Table 6). Considering these questions, the Chi-square test of the model's inadequacy is rejected at the 0.01 significance level, suggesting that the four variables are related to each other, as endorsed by the KMO statistics above 0.50.

To test the results of the factorial analysis considering the relationships among the selected variables, questions $Q_{13A}$ and $Q_{13B}$ about the penetration of mobile payment instruments in 2025 and 2030 were considered. Higher values for the variables indicated greater optimism by the respondent about the innovation.

The estimation results showed that question Q8 ('cooperative activity') is not explanatory as an internal determinant at the 0.1 level of significance. The grey line in the path diagram of Fig. 2 represents this performance.

All other variables presented results as expected, with questions $Q_7$ ('decentralized decisions'), $Q_{10}$ ('economies of scale), and $Q_{11}$ ('joint service supply') presenting robust relationships with the innovation construct at the 0.05 level of significance. Thus, if not all five constructs delineated by the literature review were captured by the quantitative examination with the specialists, three of them demonstrated significant association with the construct 'internal factors,' related to the success of firms operating mobile payments.

**Table 6** Kaiser–Meyer–Olkin statistics. *Source*: author

| Variable | $Q_1$ | $Q_2$ | $Q_4$ | $Q_6$ | $Q_7$ | $Q_8$ | $Q_9$ | $Q_{10}$ | $Q_{11}$ | $Q_{12}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| KMO | 0.37 | 0.42 | 0.49 | 0.29 | **0.52** | **0.69** | 0.42 | **0.65** | **0.59** | 0.43 |

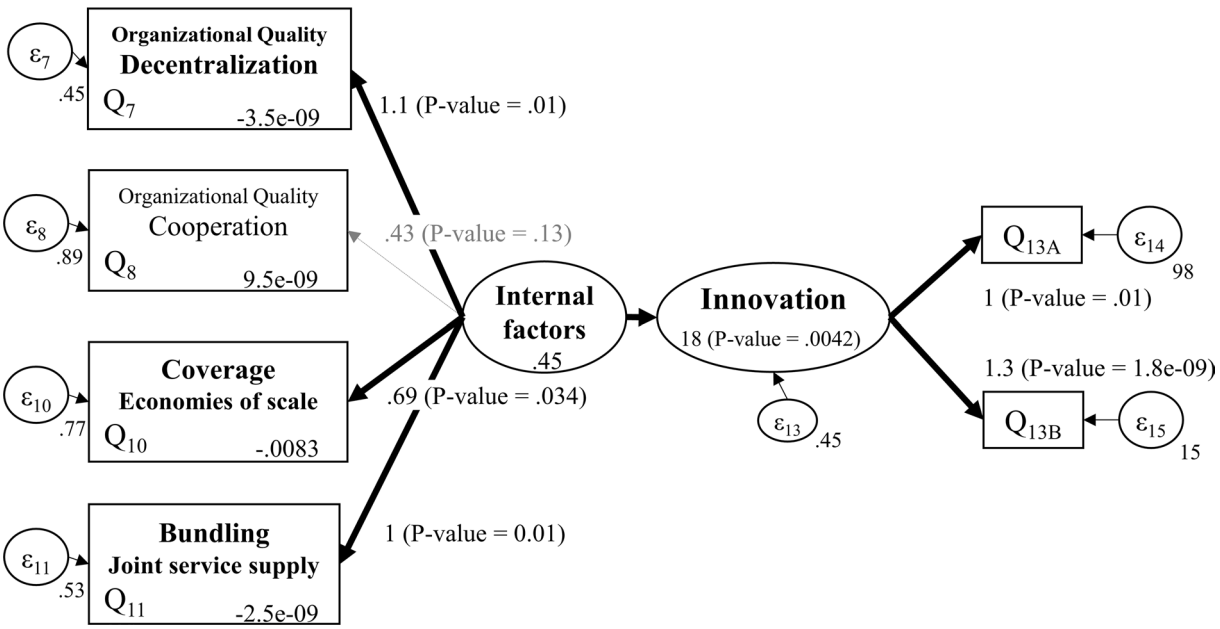



**Fig. 2** Trajectory diagram. *Source*: authors

## Conclusion

We pursued to select factors that are important determinants of firms in the mobile payments space. Aiming to accomplish this task, we promoted a triangulation of information among the existing literature, the prominent cases of M-Pesa, Alipay, and Nubank, and the opinion of Brazilian experts in the payment market, selecting some elements that contributed to the expansion of mobile payment initiatives.

### Theoretical and practical implication

The overall result indicates that organizational resources and management subsystems are relevant to the success of mobile payment enterprises, which usually run as platforms. Three related factors were present throughout the investigation and thus were selected. Other factors relate to mobile payment initiatives, such as the embedded technology applied, did not appear as frequently as the managerial aspects.

The first proposed determinant integrates a managerial aspect regarding organizations with organic and flexible structures, open communication characteristics, and decentralized structures of power, in opposition to mechanistic, closed, and bureaucratic organizations. It has become clear that all companies in the case study showed qualifications for an organic type of firm, at least relative to their main domestic competitors. Directly associated, the expert questionnaire also endorsed this idea when the variable 'decentralized decision' (i.e. Question $Q_7$) was not rejected. This result aligns with the perspective that organic structures are more innovative and suitable in unstable and turbulent environments [13], such as those presented in the mobile payment competition arena.

The second determinant relates to an antecedent and large network, which provides critical mass to a payment platform and allows it to enjoy economies of scale [33, 34, 45, 78, 82]. Consequently, an entrant in the payment business segment with a large and established network has a better chance of success than another entrant that is forced to build its own network from scratch. The importance of an antecedent network that is ubiquitous and spreads throughout the country has been mentioned and admitted in interviews [SAF1, SAF2, ALI1, and ALI2].

Furthermore, the second determinant is related to the non-rejection of question $Q_{10}$, suggesting that economy of scale in a system or service of mobile transactions is relevant to the development of the sector. The factor is called coverage in this study, which advocates for the need of a prior network to generate enough critical mass, opposing Staykova and Damsgaard's [84] vision, which supports that mobile payment instruments should start their activities focusing on one side of a platform. We argue that the alternative "start big" or seek a "bigger brother", as suggested by Eisenmann et al. [33], seems more seductive among the entry options.

The Nubank case proved to be an exception regarding entry strategies and deserves further attention. Instead of relying on an antecedent network, it expanded its customer base through an attractive value proposition and aggressive price competition. Although Nubank has achieved significant growth and valuation, with a successful IPO at the end of 2021, its profitability is still an event to be proven and could be further investigated.

The third determinant that is relevant to the development of mobile payment instruments is bundling. In our context, the bundling strategy refers to the broadness of options disposed to users through a single channel accessed via a mobile device, which increases the network value of this channel. It is associated with the idea that offering other services together with the mobile payment service itself is appropriate to its development [14, 18, 19, 85]. Considering that mobile payment instruments are often two-sided platforms that operate in electronic networks [48], the experts identified this variable as an important one, with the question $Q_{11}$ ('joint service supply') being not rejected in the questionnaire, and the cases studied confirmed that all analysed companies moved towards expanding the number of services. Accordingly, the result is aligned with the idea that bundling different complementary services increases the profit or the penetration of the initiatives.

It is important to mention that external or environmental variables were excluded from the results, but the implication of a lower relevance of these factors should not be taken too far. At least one justification is crucial. Any prohibitive regulation, which by definition is external to the business, can restrict the activities of the affected segment. Thus, the analysis of external elements in a more comprehensive vision imposes the maintenance of the external construct in a final model of determinants of innovative firms in the mobile payment segment, adhering to a contingency approach. However, the results' emphasis on the three discussed determinants (that are somehow under the control of organizations) was a striking result.

This study make at least three contributions to the literature. First, it supports the idea that companies presenting organic and flexible structures with open communication and decentralized decision processes increase their chances of success in the mobile payment arena. Second, the study supports the idea that critical mass and the provision of different services other than the payment choice are also relevant as determinants of the success of mobile payment initiatives, as suggested

by Kazan and Damsgaard [48], Staykova and Damsgaard [84], and Hasan, Liu, Kitchen, & Rahman [42]. Third, the results question the entry idea brought by Staykova and Damsgaard [84]. While they advocated for a one-sided market start, we bring the option 'start large' as a plausible choice.

Lastly, the selected factors have a pragmatic application because they can be used in the analysis of mobile payment markets. For example, the set of determinants can serve as the basis for sorting out the perspectives of companies offering mobile payment instruments in a country. The greater the companies' adherence to the qualities suggested, the better their chances for success.

### Policy recommendation

The overall result could be used to draw relevant policy implications. Although the questionnaire suggested that external environment factors are not relevant to the success of mobile payment initiatives, in theory any prohibition imposed by law or government norm could be effective. Consensus signals that governments should impose non-restrictive regulatory frameworks for diffusing innovations, such as new payment instruments, and we bind to the same idea. In this line of thought, as mobile payment firms can face regulatory and supervisory entities, governments should refrain from imposing harsh requirements, specially to non-systemically important entrants.

Finally, the study suggests the necessity of mobile payment firms to focus on strength their organic characteristics and flexible structures, applying an open and participative management and avoiding excessive centralization of decisions. In this regard, large companies trying to enter the mobile payment segment should take a spin-off as a serious option to refrain from single control which diminishes the chance to propose disruptive innovations.

### Limitations

This study has some limitations. One major drawback is that the employed variables have few precise concepts. As mentioned by a reviewer, the confounding meaning of some variables is an important limitation that should not be disregard. Accordingly, the analysis did not discriminate between related theories to present definitive validations. For example, a management body that practices greater labour force empowerment must be differentiated from an organic structure in Burns and Stalker's [13] sense. Given its nature and the imprecision meaning of some variables, the study adopted a more comprehensive and necessary perspective for an exploratory approach over a new business which are mobile payments.

### Future research

Nubank showed an entry strategy that deserves further attention. As previously mentioned, Nubank has expanded its customer base through an attractive marketing strategy, instead of relying on a large antecedent network. Thus, the coverage factor discussed in this text can be further explored applying the questionnaire to a larger group of experts. The endorsement (or not) of the mentioned factor seems to be worth the effort of more investigation.

Furthermore, as an attempt to address the theme mobile payments, we relied on three cases only. Common ground to almost any empirical study, a broader number of cases can be incorporated into analysis in a subsequent paper.

At last, this study was retrospective, with evaluations and analyses based on past events. Because of that, there is no guarantee that the selected factors are sufficient for any coming mobile payment initiative. In this regard, foresight studies on the subject could contemplate a desirable future.

#### Abbreviations

| | |
|---|---|
| DOI | Diffusion of innovation |
| IPO | Initial public offer |
| KMO | Kaiser–Meyer–Olkin |
| MST | Magnetic secure transmission |
| NFC | Near-field communication |
| PBC | People's Bank of China |
| SEM | Structural equation modelling |
| TAM | Technology acceptance model |
| PC | Personal computers |

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#### Author contributions

All authors have made substantial contributions to the conception and design of the current study, participating on the construction, analysis, and interpretation of data. All of them took active role on the writing of the paper and on its revision.

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#### Availability of data and materials

The data that support the findings of this study were constructed from authors based on questionnaire sent to specialists. They are disclosed to reviewers and are available from the corresponding author on reasonable request.

## Declarations

#### Ethics approval and consent to participate

Not applicable.

#### Consent for publication

Not applicable.

**Competing interests**
The authors declare that they have no financial or non-financial competing interests with the current study.

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