

Designing a Digital Payment Framework for HEI's Using Smart ID

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Abstract—The rise of digital payment has proliferated the business industry. In fact, cashless payment in developed countries have been one of the norms to improving services, making it easier for the management to ensure timely payment collection. The main objective of the study was to design a digital payment framework for Higher Educational Institutions in the Philippines to improve the services, payment transactions and solve behavioral issues of students in settling their school fees by converting student ID into Smart ID. A pre-tested questionnaire was used for data collection and 288 participants among students, parents/sponsors was drawn using snowball purposive sampling. A combination of qualitative and quantitative method was applied to present the data and validate the findings. Results revealed that 9% among 6596 total enrolled students had remaining balance at the end of the semester. Whereas 66% scholars agreed to fail in paying their fees on time due to some priorities (WM=3.24). Consequently, 63.3% (N=100) were unable to pay their tuition fee on time because they were unable to manage their money vs. personal expenses. Also, 60.9% (N=50) were unable to get their exam permit for the 3-exam period even fees were fully settled. Moreover, 75% among parents working abroad preferred the use of smart card for payment to ensure that money is consumed to tuition fee payment as to where it is intended. Whereas, the HEI's positive feedback in considering new payment technology relies on their partnership with banks to suffice the facilities for top-up machines, card scanner/reader and the overall software and infrastructure. Study further concludes that the implementation of smart ID may possibly contribute to educational environment giving them the assurance that school fees are paid on time and the advocate to promote a sense of responsibility for students to prioritize their financial obligations.

Index Terms—Cashless payment, digital transactions, framework, HEI, school, smart card, smart id.

I. INTRODUCTION

The impending use of smart card has already proliferated the educational environment. In fact, several countries such as Singapore, Malaysia, Zimbabwe have adopted smart technology in institutions where cashless payment is implemented in their school-related transaction. In the Philippines, 2 universities- Lyceum University of the Philippines and De La Salle University have already implemented digital payment method using smart card. Apparently, no success stories have been recorded to rationalize its utilization. After a careful collaboration, it was found out that its implementation has not undergone initial

investigation to whether the students and educational institution has positive adoption on the use of smart card technology. Whereas, no such pre-investigation nor post study was conducted to investigate its usefulness both to students and the school management.

Thus, the study aims to (1) identify the issues encountered by parents, students and school management in terms of (a) settling financial obligations in school (b) efficiency of payment collection and (c) security of monetary collections; (2) identify the factors to be considered in conceptualizing the framework in terms (a) production of smart ID, (b) availability of facilities such as top-up machines, smart ID reader/scanner, (c) readiness of the school management, (d) readiness of the parents, scholarship sponsors and students and (3) design a framework that is suitable in the implementation of smart ID cashless payment among Higher Educational Institutions in the Philippines.

A. Digital Transactions in the Philippines

Bangko Sentral ng Pilipinas (BSP) is the central bank of the Republic of the Philippines that oversees, supervises banks and exercises regulatory powers over banks in the Philippines [1] As part of its vision to adopt technological advancement in business sector, [2] confirms that BSP has been trying its best to improve the payment system in the country. As a matter of fact, BSP has developed the National Strategy for Financial Inclusion (NSFI) which focuses on the need to reach out to those who are financially excluded. The motivation to implement NSFI is to provide a facility for people living in urban areas to make online transactions through the use of cards due to poor physical banking access. Furthermore, it aims to encourage more customers to migrate from cash to non-cash payment. Meanwhile, to enable security on transactions, BSP has mandated all banks in the Philippines to adopt and integrate the Europay MasterCard and Visa (EMV) to the debit cards until 2017. Similarly, [3] corroborated that BSP adopted the NSFI in 2014 which aims to reached at least 20% increase on cashless transaction in 2020 but still needs to be observe because the success of its goal would still rely on the people's positive adoption and exposure to technology and with that, the merchants will then go with the flow and be encouraged to go cashless to be able to create a surge of cashless payment channels and further improve its financial inclusiveness in the Philippines. It was also reported by [4] that the number of cashless transactions in the Philippines had increased to 10% ratio during the first quarter of 2018 as compared for the past 3 years which only gained about 3% increase. Correspondingly, [5] verified that the number of inflow and outflow of e-money transactions as recorded by BSP has evidently increased from 2015-2016 which has even reached almost 1 trillion pesos amounting to

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PHP 956.1 billion, a 4.3 increase from 2015 transactions. Whereas, an increase to 21.4% and 8.9% was recorded from the number of registered and active e-wallet accounts. Additionally, the issuance of Automated Teller Machine (ATM) debit cards has increased to 24.1%. While prepaid and credit card did not increase, thus, it encourages that there is still a large reason to study the adoption of digital financial transactions in the Philippines.

B. Current Situation in Schools

School fees and levies have become a bone of contention when schools open to both parents and the school management, yet alone, to boarding schools. This means that the essential existence of collections based from the tuition fee payment made by parents of students is important. However, several issues have risen as to tuition fee payment collection and its security to schools. In Zimbabwe, [6] discovered that because parents do not honor their financial obligations on time, schools were unable to purchase the necessary materials as soon as the schools open. Because of this, the school management is left with no alternative save to employ disciplinary measure to compel parents to pay their financial obligations on time. Also, Maryland school has encountered persistent cash shortages due to recurrence of late payment from parents for children's tuition fee which has resulted to cash lying idle in the bank. What the school did was they have used both discount and payment model to address the issue on late cash payment by charging debtors an additional fee to induce parents to make timely payment [7] Similar issue on fee collection was conducted by [8] to whether providing feedback on norms of university tuition fee payment could encourage students to pay their unsettled fees in University College London. To solve the problem, feedback has taken place by utilizing email facility to send reminders to those who have not settled their financial obligations. Accordingly, [9] has also investigated the late tuition fee payment collection in Jamaican University in a manner that is effective but not sensitive to students' financial obligation. Study has shown that that there was a significant relationship between IT system and students being financially cleared at the release of examination result. As to security issues, [10] defines fraud as a civil crime that provoke a person to do intentional deception to gain or damage another individual. And according to them, the crime has been prevalent to school because they are the most vulnerable to fraud when dealing with money. This has become their motivation to investigate ways to prevent cash transaction in school.

C. Cashless Payment in Educational Environment

The impending use of smart card has also proliferated educational institutions. As a matter of fact, schools in India, Nigeria, Singapore and European countries have adopted the Digital Payment Method (DPM) known as cashless transaction [11]. This is evident as [12] agreed that smart card has been widely used in developed countries not only for products but also in services like public transport system and is even usable in food courts, toll system, Enterprise Resource Planning (ERP), parking, supermarkets and even some schools in Singapore where cashless payment has been implemented for school fee related transactions. Similarly, [13] has explored the possibility of developing smart card as

a university application and investigated its potential to reduce the university business administration process and its positive impact to their service efficiency. Also, [14] explored the possibility of adopting cashless payment in schools in India where most of college administrators also agreed that the adoption of cashless transaction has no issue because millennial students are becoming excessively tech-savvy. Thus, their positivity to adopting new technology may result to a more convenient process to both parents and management especially when online payment is implemented for paying school fees. Moreover, cashless payment in educational institution can led into easier financial transaction, transparency, lessen fear of theft, efficiency, keep track of expenses, benefits to banks and may even contribute to proper hygiene because students need not to carry cash on hand. With the potential use of cashless payment in school, [12] designed a multi-purpose student card system using smart card technology for educational institutions which enhanced the typical student ID. The said multi-purpose student card was mainly intended to replace the magnetic student card and was used in several transactions for retail, identification, transportation, financial transactions and for security. Whereas, study has resulted to a positive adoption of smart card among students because of its versatility, practical use, security, efficiency and usefulness. Whilst [15] unveiled that the implementation of cashless payment may require the existence of automated teller machine, electronic purse/wallet, smart card and may even demand banks to offer services such as mobile banking, e-transfer, and mobile money. Moreover, to successfully implement cashless payment in schools, [16] addressed distinct aspects that need to be considered such as economic, social, technological adoption among students, including institutional and law aspects.

D. Existing Digital Payment Frameworks

In the proliferation of technology, several studies have been conducted to explore the impending use of smart card in promoting convenience to services and payment transactions. In the study of [17] a smartcard framework was presented to securely manage applications on smart card. As a result, a User Centric Card Ownership Model (UCOM) was used to assist cardholders to manage applications on their smart card. The motivation of integrating UCOM was driven by Near Field Communication (NFC), Secure Element (SE) and Service Providers (SPs) which is commonly used in mobile transactions. With the use of aforementioned models, Trusted Service Manager (TSM) could further be employed to establish trust relationship to the industry and the telco. Additionally, using UCOM, cards may be acquired from User-Centric Smart Card (UCSC) suppliers who can also be a smart card manufacturer. By integrating smart card for payment schemes, there may already be an underlying Smart Card Operating System (SCOS). Similar study in exploring the usefulness of smart card, [2] revealed the challenges and opportunities of implementing electronic payment system in the Philippines. Wherein, the researcher's conceptual framework has uncovered participants demographic and the kind of online transaction which was found to influence student's perception on electronic payment. Further, it was found out that the devices used to transact online and the

payment scheme may also impact student's acceptance to the use of smart card in schools. While [18] prove that students and parents' initial knowledge and awareness in using smart technology has an impact to the continuous patronage in using smart card for payment transactions. While [19] revealed that students' exposure to smart card using Radio Frequency Identification (RFID) has influenced their adoption of smart ID for school related transactions.

II. METHODOLOGY

Survey and interview was applied for data collection. The survey instrument was reviewed and approved by the CICTS Research Director from University of the Cordilleras, Baguio City Philippines. The survey form was uploaded in [20] for referencing. Data was collected from PHINMA-University of Pangasinan, Philippines and snowball purposive sampling was applied to draw the 317 students from University of Pangasinan, 8 parents were interviewed during the payment collection period and 2 employees from finance department were interviewed to know their perception to the possible implementation of smartID in the educational environment. Both quantitative and qualitative approach were adopted to assess the validity of findings. Descriptive statistical analysis was used to analyze and interpret the results. While review of secondary references of the existing digital payment frameworks was conducted in reference to the conceptualized framework.

The conceptual framework was designed by considering the issues encountered by students, parents and management. Contact Smart Card (SSC) was adopted in conceptualizing the framework to be able to manage the data that is stored in a programmable chip. Contact Smart Card is a type of card that is programmed using a reader that connects to the computer chip on the card. Thus, CSS is expected to have its SCOS installed on it and connecting it to Electronic Data Capture (EDC) machine when initializing transactions [12]. Through the programmable and integrated EMV chip, data are more secured and it would be more convenient to customize the data format as student Identification (ID) details should come from the institution, generated by its Information Technology Services Department (ITSD) during the period of application for students ID. By adopting this type of card, it is possible to manage the data according to (a) students' identification and student type (b) card status and account details (c) transaction details. Also, since bank will provide the smart card for the school, the Application Management Server (AMS) of the bank can be utilized to restrict the use of smart card within the institutional transactions only. AMS is concerned with managing the application processes that is installed into the smart card. This further contributes to ensuring security of transactions because the Service Provider (SP) of the bank will take care of the authentication of card through Application Services Authentication Server (ASAS) [17].

III. RESULTS AND FINDINGS

A response rate of 90.85% (N=288) from PHINMA-University of Pangasinan students were gathered. 57.99% (N=167) of them were Male and 42.01% (N=121) were

female. Participants also came from various year level knowing that students who have been in the university for several years would better express their experiences and thoughts regarding the existing payment system in the institution. Statistics has revealed that 46.88% were seniors, 31.60% were juniors, 14.93% were sophomores, 3.47% were 5th year and 3.13% came from freshmen level. Study has revealed that among 288 students, 67.01% of them are supported by parents for their education, 16.32% were supported by their relatives while 10% were supported by siblings and the source of income of the person supporting their education are based from their salary. Noticeably, 35.07% of the salaried employees are employed in their home country while 32.29% of them are Overseas Filipino Workers (OFW). Surprisingly, while parent/ relatives are employed in the homeland, analysis has shown that 31.06% prefers to give their children's allowance and tuition fee payment through bank deposit and remittance rather than giving it to the student's guardian since they are working outside provinces. While 54.51% among parents who are living with children prefers to give their allowance and payment fee in cash.

A. Issues Encountered by Parents and Students When Settling Account

Eight (8) Parents were interviewed to know the issues they encounter when monitoring children's school record. Interview has revealed that 5 parents were having a difficulty to talk to their children because they cannot directly answer why their grades doesn't show on the student portal. They need to go to school and talk to the dean or college clerk to confirm the grade of their child, only to find out that the tuition fee of their child was still unsettled- the reason why grades are not viewable due to unsettled financial obligation. Also, nowadays with the computer skills of students, it was revealed that students were able to imitate examination permit just to let the parents know that they have settled their account but actually not. Moreover, 6 Overseas Filipino Worker parents have revealed that they usually give payments to their children before the examination period but they were unable to pay their fees because of the influence of their friends, thus the school gives an option to avail of student loan just to settle their tuition fee but parents are still obliged to pay according to the promissory note. Thus, resulting to another financial obligation for parents.

Two (2) groups of students were asked on issues they encounter when settling their school fees. Analysis has revealed that 45% among participants were scholars while 55% were non-scholars. Despite being a scholar (N=130), 66% among students still fails to pay their fees on time due to some priorities (WM=3.24). Because of the notion that their allowances are given on hand, the students are tempted to spend the money on other important things rather than paying their school fee. This is evident as 70.8% (N=92) among them agreed that they still fail to pay the remaining fees they need to pay during exam period. The reason why 3.3% of 6596 enrolled tertiary students applied for student loan at the end of semester, knowing that there is an expected fund to receive for the next semester. The result also coincides with data from finance department that 166 scholars applied for promissory note ending the 2nd semester of the academic year. While 59.7% (N=77) were unable to get their exam

permit even scholarship funds have been forwarded to the institution. As a result, scholars were unable to get permit automatically and with that, they were unable to take the examination. Expectedly, 48% (N=61) scholars had no issue on long queue because they need not to pay on the teller as their names have been forwarded to the institution by the scholarship sponsors and so, payments are collected automatically by the institution. Non-scholar students (N=158) had comparable issue with scholars wherein 61% (N=89) were unable to pay their fees on time because of some priorities once they have received their allowance. Thus, regardless of the type of student, students are enticed to spend the money once they have it which is supposed to be intended for tuition fee payment. Also, 63.3% (N=100) were unable to pay their tuition fee on time because they were unable to manage their money vs. personal expenses. Additionally, 60.9% (N=50) were unable to get their exam permit for the 3-exam period even fees are fully settled before the class semester starts. Hence, they need to wait for the announcement of per term exam period for the teller to release the exam permit. As to the convenience, 58.3% (N=91) students were unable to pay during payment period because the procedure is hassle and time consuming. This can be attributed to 57.7% (N=90) students who prefer not to pay on time because of a long queue. Thus, 58.3% (N=91) non-scholars prefers to pay at the end of semester instead. Remarkably, 65.2% (N=103) students agreed that they were unable to pay tuition fee on time because it's not them who manage their own budget and sometimes it is spent to something else rather than to their tuition fee payment.

B. Issues Encountered by Management in Tuition Fee Payment Collection

The interview with finance department of the institution corresponds to the issues revealed among scholars and non-scholars. Record has shown that with a total of 6,596 enrolled tertiary students represented by 5 different colleges for 2nd semester AY1819, 9% (N= 579) were unable to settle their accounts which has resulted to uncollected fees at the end of the semester. Record also revealed that 15.62% among 6377 were collected via bank deposits while 84.38% made their payment through teller. This is associated among 57.7% students having behavioral issue when settling their account that because of long queue, the payment process becomes hassle and time consuming. Thus, 58.3% of respondents preferred to pay their fee at the end of semester the reason why they do not pay on time. Correspondingly, tellers of the institution have confirmed that they experience long queue when approaching examination day because students cram to pay a day or two before schedule of examination. While collections from students in graduate and law school is frequently delayed because students usually pay during finals or upon enrollment for the next semester. This can be attributed to students' behavioral issue due to long queue and even they already have their money, they opt to delay the payment for their convenience. While subsidies on tuition fee payment for scholarship grantees are collected late because funds from scholarship sponsors are usually received at the end of academic year. As to institutional expenses, the institution still manages to control the expenses over the collections because 91% among tertiary students copes to pay

their fee before the end of semester. Whilst the management uncovered that students still need to claim their permit despite paying thru bank deposits as the system is not linked between bank and the institution regardless of partnership. Similarly, students who pay in full do not claim their permits during exam because they are not fully aware of the policy on issuance of examination permit over full tuition fee payment as confirmed by finance department.

C. Factors Influencing Students Perception in Embracing Smart ID

Two hundred eighty-eight (288) respondents were asked about perception to embrace smart ID in school. Survey has revealed that 95% has positive response to adapt smart ID while 5% are not. This can be attributed to their answers which influences their perception to embracing the use of smart ID. 274 respondents conformed their positive perception to using smart id. 84.3% said YES if there is an appropriate orientation administered by the institution on how to use the smart ID; 62.7% would like that policy should be put in place before its implementation and; Consequent to the study of [15] as to the availability of facilities, 60.10% practically considered the availability of installed facilities in the campus such as top-up machines, card reader, smart ID production and collection of information relevant to the need of bank for opening a bank account for students. This is to ensure sustainable usage and implementation of smart card technology. Subsequently, 32.7% were already exposed to using smart card and since they have already experience the convenience and security of using it, they are keen and positive to the potential implementation of smart ID for ease, convenience and innovative way of payment system in the university. Fig. 1 shows students feedback on the factors influencing their ability to embrace smart card technology.

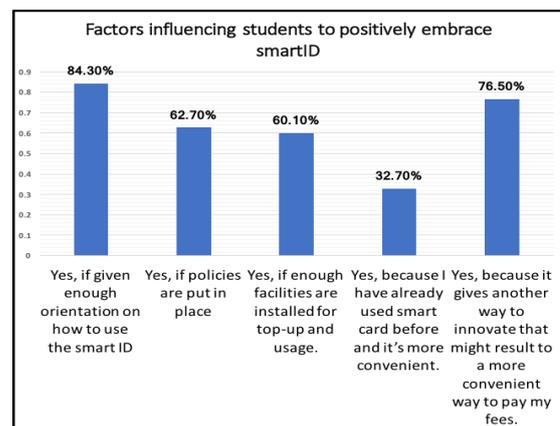


Fig. 1. Factors influencing students' perception to embrace smart ID.

Relative to the need of students for the orientation, survey also revealed that among 5% (N=14) students who have expressed their doubt to embracing smart ID 80% (N=11) have fear in using smart card. Table I shows the actual data on student's openness to implement smart ID in HEIs. Analysis has found out that these students never experienced using smart card for any transactions. Also, 30% (N=4) confirmed that they have no knowledge in using smart card and these students have never experience going to the bank for any transactions. Thus, they have this perception that smart ID might be impractical and insignificant for them.

Further, students with positive perception in using smart ID have expressed their expectations whenever student ID will be converted to smart ID

TABLE I: STUDENTS' OPENNESS TO IMPLEMENT SMART ID IN HEIS

STATEMENT	N	WM	STD
a. Using smart card for payment might promote greater responsibility, awareness and innovation.	280	4.3	0.7
b. I think using smart card in payment transaction is more convenient than cash	285	4.1	0.8
c. Using smart card for payment transaction might help me in prioritizing and managing my important expenses.	283	4.1	0.7
d. I think using card for payment transactions is more practical because I can easily monitor my expenses through transaction history rather than paying in cash.	283	4.1	0.7
e. I feel more secured on my way to school if I use card for payment rather than cash.	283	3.9	0.9
f. I have already used smart card before (e.i atm card, credit card, gcash, smartmoney, etc.)	283	3.7	1.1
g. Using cash for payment is more convenient than using card.	280	3.4	0.9

Surprisingly, students nowadays have positive response to using technology because with WM=4.3 (N=280) they believe that using smart card can promote innovation, greater responsibility and awareness to students' behavior in spending their money for payment transactions as comparable to the study undertaken by [12]. thus, using card for payment transactions can be more practical because transactions history can be easily monitored rather than paying in cash (WM=4.1, N=283). Wherein through

transactions history, it might already help the student in prioritizing and managing their important expenses (WM=4.1, N=283) which might lead to a more convenient and efficient payment procedures. Whilst, 64.7% (WM=3.9) feels that they might be more secured if they only have the card with them instead of cash in their pocket while on their way to school.

D. Conceptualizing Design of the Digital Payment Framework for HEI's

Factors were taken into consideration to design a conceptual framework for the digital payment method that might be applicable in HEIs. Factors influencing students to embrace smart ID such as orientation, policies and, availability of facilities were discussed with the management to ensure sustainable implementation of the new technology. Relevant to the study of [16] social aspect needs to be considered as one of the factors in embracing smart card technology in schools. A positive response from the management was obtained to implement the new technology. Hence, active cooperation from Marketing, Center for Students Development and Learning (CSDL) and Finance department is considered for policy making and orientation purposes. Also, a diplomatic partnership with bank was observed to properly negotiate the procurement of facilities essential to its implementation. This is to ensure that facilities are provided by a partner bank and data security is managed by the bank. Facilities to be provided by the bank includes production of smart card, acquisition of card readers, cellphone for data connection and efficient transactions. The IT Services Department (ITSD) of the institution takes care of the production of smart ID which already integrate students picture, student number, card number and other details.

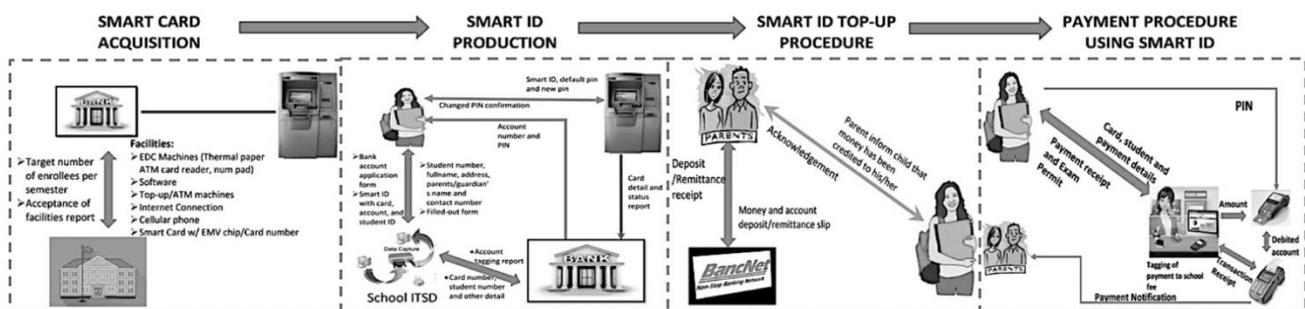


Fig. 2. Digital payment framework for HEIs using smart ID.

The digital payment framework works by acquiring the smart card by bank supplier. The number of cards to be produced is requested by the institution through the marketing department based from the projected number of freshmen students to enroll in the institution. After which, the bank sends request to their supplier. In this process, the bank may adopt UCSC framework when acquiring smart card from supplier where SCOS and EMV chip are already expected to have been integrated into the card. Thus, the card already contains the EMV chip for security and the card number. Once the bank has delivered the smart cards to the institution, ITSD may start producing the smart ID by collecting information from students. Prior to printing, ITSD

should record the card number tagged to student number with their respective student details. A report is then forwarded to bank for monitoring. Once report is generated by ITSD, the bank may already assign a bank account number to students' account based from the forwarded student details with card number, student number, contact number of parents/ student and the address. Then a letter is sent by bank to the student/parent of student for them to receive their account number and temporary pin. Once received, the recipient is required to activate the card and change their password for security purposes. Parent then may already top-up the smart ID to any bank affiliated to bancnet. To pay school related fees, student may go directly to the teller section, selects the

type of transactions, present his card for payment and the teller inserts the card to the Electronic Data Capture (EDC) machine. Once connection is established, the teller requests the student to enter his password on the EDC machine. For successful transactions, the machines will print two (2) copies of receipt. The first copy is given to student and the 2nd copy is left to the teller. Finally, the teller issues examination permit to student and electronic copy is also sent to students/parents' email address for immediate claim of the examination permit upon payment. SMS alert shall also be received by parents for notification purposes. The advantage of the smart ID is that it does not support withdrawal using the Automated Teller Machine (ATM) which are located outside the campus. The smart ID is purposely designed to solve student's behavioral issue in handling the money sent by parents that is intended for school related fees. Thus, the smart ID can only be used within the university campus and within the teller section of the university. Fig. 2 shows the conceptual design for card acquisition and digital payment framework.

IV. CONCLUSION

The study has provided relevant and adequate information for the HEI's to potentially embrace the use of Smart ID. However, the conversion of student ID into smart ID requires the involvement of people that will comprise the successful implementation of the framework. The management should ensure its readiness to establish partnership with banks, provide the necessary facilities and its willingness to embrace new technology and improve the existing payment procedures. Also, the adaptability of both parents/scholarship sponsors and students to using smart card is needed to ensure a sustainable culture of embracing technology in the institution. The ease of use and convenience can be assured only when parents were able to transact through banks and students can afford to continuously use smart card instead of cash. Further, the smart card technology has existed for several years where students nowadays are becoming more exposed to a more convenient and constructive transaction procedures. Thus, the introduction of smart ID in HEI's may positively result to a potential adaptation among students, the school management and the banks. Study further concludes that the implementation of smart ID may possibly contribute to educational environment giving them the assurance that school fees are paid on time and promotes sense of responsibility for students to prioritize their financial obligations. While this study concludes 95% among respondents having positive perception to embrace smart ID, the parent's perception through wide data collection should have been considered to paramount the impact and sustainable use of smart ID.

CONFLICT OF INTEREST

This paper was carried out without any conflict of interest. The author declares no conflict of interest by any means.

AUTHOR CONTRIBUTIONS

Desiree Cendana, the main author has solely designed the paper with the intention of innovating payment process in

Higher Education Institutions in the Philippines. All the process from collecting literatures reviews, data gathering, analysis and design of the framework was done by the authors. Acknowledgement was given to those people who have contributed and collaborated on the authors' endeavor.

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