

A Study to Identify the Adoption Intention of PEN Card amongst Diverse Groups

Rahul Kumar Ghosh, Anirban Das, Samir Kumar Bandyopadhyay

ABSTRACT--- In India, the use of information technology in the private sector is a reality in all areas. However, in terms of public governance, India has been operating very slowly. The population is not yet sufficiently developed and the infrastructure is not up to date. Under these circumstances, providing public services to the general population is extremely difficult. A general perceptual Intention to Adopt (IA) model and a technological framework have been developed in advance to support the IA model through Permanent Education Number (PEN) card to propose the electronic credential system in Indian education system. However, the differences in the intention to adopt the PEN card were not measured. Therefore, this study was conducted to measure the differences in intention for adoption of PEN card among various groups of adopters. The present study concludes that among the three groups (students, teachers and non-teaching staff), two groups, namely students and non-teaching staff, are having an early adoption intention compared to the teaching staffs.

Index Terms—Education System, PEN Card, E-Governance, E-Credentials, Digitalization, Permanent Education Number, ICT, One-Way ANOVA

I. INTRODUCTION

In the present time the world is becoming smaller day by day with the blessing of internet. It can be mentioned that internet has encircled the world. In particular, e-government and e-commerce are used throughout the world for a variety of management tasks and offer citizens a variety of services.

The idea of e-governance has its beginnings in India amid the seventies with an emphasis on advancement of in-house government applications in the regions of defense, economic monitoring, planning natural disaster, insight-trade, climate forecast and the deployment of Information Technology (IT) to manage data-intensive functions related to elections, census, tax administration, immigration, emigration and so on. From mid-nineties, IT advances were amazingly supplemented by Information and Communication Technology (ICT) innovations to improve its utilization in a more extensive segment with strategy accentuation on connecting with rural areas and taking in more noteworthy contributions from Non-Governmental Organizations (NGOs), self-sufficient, open and private segment also. There has been an expanding inclusion of worldwide donor agencies under the system of E-Governance for advancement to catalyze the improvement of E-Governance laws and advances in under developing nations [25].

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It is recommended that while India has a rousing vision of where E-Governance is going there is a gap between benefit conveyance and reality in the nation. The challenge of E-Governance in India lies in giving the service to around a billion people [20]. While half of the nation is getting up to speed, quick advance is being deferred because of operational, monetary, work force, arranging and usage issues. The fundamental basic purpose behind these issues has been recognized as an over accentuation on putting resources into equipment and too little accentuation on creating programming and administrations [30].

A study has proposed an E-Government framework for supporting the Intention to Adopt (IA) model and suggested to provide Information Technology Enabled Services (ITES) via a simple plastic card termed as Permanent Education Number (PEN) card [19]. The current study has been undertaken to measure the variances in intention for adoption of PEN card among various groups of adopters. Therefore, this study helps identify the most significant and insignificant group of PEN card adopters.

II. LITERATURE REVIEW

The education sector is one of the largest sectors of India, where a large number of students are enrolled each year. In particular, India has the second highest student rate in the world after China. Registration across all modes (regular and distance) at various levels in India is 345.8 lakhs and is separated at different levels (see Fig. 1). India has the second largest higher education system in the world, measured by absolute enrolment, after China [2].

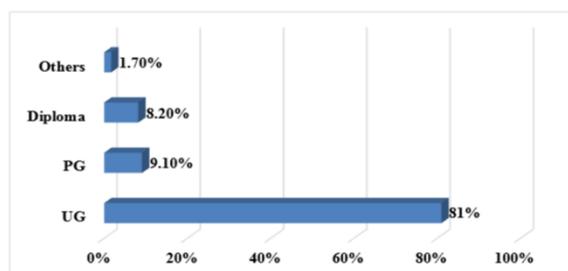


Figure 1. Enrolment Ratio at Different Level

The management of data of such large student's volume is a difficult task, since currently it is not possible to carry out an adequate and timely verification of credentials and testimonial, which leads to a greater number of falsified credentials and degrees [18]. The increase in paper requirements for photocopying these credentials and testimonial is also a major environmental problem [17].

Technology today has an unsettling effect on education as it is acting like a catalyst. From the knowledge transfer model education is shifting towards a combined, dynamic, autonomous and engaged model. This transformation could not have originated at a better time for India at the period of digitalization [10]. Digitalization is the amalgamation of digital technology into routine life of human beings. The precise meaning of digitalization gives an apparent idea of development & technology-dependent world [32]. Hon'ble prime minister Shri Narendra Modi's emphases on the digital India campaign seems to be increasing the possibility of technology acceptance across India [10].

A. Present E-Governance System for Education Sector

One of the well-known e-governance framework for education institute is the M-Star Education Expert system, which have been tested in many schools of India. This framework presently works in various schools & colleges across the country. M-Star was established after an in-depth study of education systems by the global multi-domain relationship management network. It is exceptionally adaptive and can therefore be implemented in any educational environment, but it can also be widely customized to fit every single compulsory factors and different requirements of an institution [23].

Applies the life cycle method as well as works as much as possible throughout the educational chain, from kindergarten to university, for a wide range of teaching programs and structures. The system closes the gap between different stakeholders in a school, for example. Students, tutors, trainers, school directors, and education administrators. For administrators, such as school boards and education departments, who must oversee the work of many schools, M-Star is invaluable for monitoring academic performance in individual schools as well as for the impact of plans such as lunch or SarvaShikshaAbhiyan. (Education for All Campaign).

The system is still running on a restrictive OMV-card for a few hundred rupees. Each adolescent and staff receives an OMV-card that can be used in any system in which the application is stacked.

By the way, the card can be used to check the frequently mentioned problem of absence of teachers. The performance of a teacher in a single school can be remotely monitored by his supervisor by not only recording his attendance records, but also measuring the appropriateness of the students' academic performance.

ICT has played a significant role in many areas of governance in reducing wastefulness and improving leadership in decision-making. An integrated system of university services is one of those ideas that can enable governing bodies to monitor the progress of the education plan across the country and provide better quality services to different stakeholders [5].

B. Service-Oriented Architecture (SOA)

In service-oriented solutions the applications must be built in the form of independent interactive service agreements that provide their potential customers with a well-defined and well-characterized platform [7]. In addition, the innovation must be accessible so that

application engineers can surf through the different groups of services, select the ones they want and combine them with the functions they want.

The service is widely implemented as a thick and detectable programming entity that exists as a single case and is linked to applications and various services through a communication model based on weakly coupled messages (regularly asynchronous) [15].

A declaration was published for SOA in October 2009. This thought of six core values which are listed as follows:

1. Business esteem is given more significance than specialized system.
2. Strategic objectives are given more significance than project specific benefits.
3. Intrinsic interoperability is given more significance than custom integration.
4. Shared services are given more significance than specific purpose implementations.
5. Flexibility is given more significance than enhancement.

Evolutionary refinement is given more significance than the quest for introductory flawlessness [3].

C. E-Governance – Main Issues in India

India population are still not developed properly and setups are not at par. Therefore, with this type of situation it turns out to be exceptionally hard to give government services to the general population. There are number of explanations behind that –

1. Technical illiteracy: In general, countries lack experience, and in countries such as India, the link between levels of education and the use of electronic media or the Internet and other ICT implications are very important.
2. Dialect Dominance: The strength of English language on the internet is a major constrains for non – English talking populace. It is discovered that of all the website pages on the internet, around 84% are in English, 4.5% in German, followed by 3.1% in Japanese, and remaining 8.4% are in French, Spanish, Swedish, and Italian. On account of India, 95% of the populace does not communicate in English. Because of an enormous strength of non – English speaking populace in India, these communication mediums internet as well as computers are very futile in Indian towns, hence the utilization of native dialects does a little to lighten the issue because of the poor proficiency level as said before [12].
3. Ignorance: There is general absence of mindfulness regarding benefits of E – Governance and the procedure associated with executing effective Government – to – Citizen (G2C), Government – to – Government (G2G), Government – to – Employee (G2E) and Government – to – Business (G2B) projects. The regulatory structure isn't intended for maintaining, storing and recovering the governance information electronically [28].



4. Absence of Participations of Society, Public and Private Sectors: Designing of any application requires a nearby collaboration between the government department and the solution designing architecture. At present the clients in government divisions don't contribute enough to design the solution engineering. Consequently the solution created and actualized does not meet the necessities of an E – Governance projects and thus does not get implemented.
5. Disparity: Disparity in accessing the public services among different groups of the population, especially between urban & rural groups, between educated & illiterate, and poor & rich [13].
6. Infrastructure: Deficiency of important setup like internet, electricity, technology and methods of communications will influence the rapidity which defers the execution.
7. Obstacles for Re-Engineering process: Application of E – Governance projects requires bunches of restructuring in administrative procedures, redefining of administrative procedures and formats which finds the resistance in almost all the departments across the levels [14].
8. Operational Reluctance: The government employee's psychology is not exactly the same as that of the private sector. In general, government officials thought these were important deposits for the government. Therefore, the need to update the Document Management System (DMS) as well as workflow technologies or publish changes in the system meets the resistance of public servants.

E-government is generally a new field of information systems that addresses the use of ICT by government agencies for the electronic delivery of their services [26]. The relationship between the government and the recipients of its electronic services is described as follows: G2C, G2B; G2E; G2G. A comprehensive review of e-government studies in the above relationships has revealed that most e-government studies are divided into five specific classifications, in which the effects of:

- a. Management practices,
- b. Individual and administrative characteristics,
- c. IT functions,
- d. Estimate of the electronic government,
- e. Government subdivisions; in the election of electronic government

III. RESEARCH GAP

Several empirical studies have been conducted in different countries, to reflect on the introduction of electronic government, for example, Singapore [16], Turkey [1], Netherlands [22], and USA [8]. Individual study contributes in understanding a well-founded hypothetical factors of the research model. The timely adoption of ICT and the vigilant use of technologies have contributed to the success of e-government research in industrialized countries [29]. Here, too, citizens of developing countries fall far behind in the adoption of ICT [24]. In India, for example, e-government research is still in its infancy [21], and a populous country cannot stop undoing the benefits of e-government implementation.

Despite the growing economic impact of India on the development of the information technology sector in Southeast Asia, some studies have focused on the introduction of e-government services in India. To our knowledge, only one empirical study deals in part with the factors behind the introduction of e-government in India [11] and some case studies that exemplify the benefits of creating e-government services. Electronic Government [6], [9], [27]. Numerous studies have analyzed the potential benefits of the implementation of e-government, given some effective regional e-government programs [4], [31]. These studies are of a theoretical, descriptive and exploratory nature and do not deliver pertinent data on the current province of electronic government in India. Efforts will be given to classify gaps in the literature that may affect forthcoming research in a developing country, such as India, and to better understand the beliefs of citizens and the organizational features of governments (state & central) to transmit, that affect the introduction of information technology, electronic communications and services offered by Indian citizens.

Hence, it is necessary to conduct a study on measuring the differences in intention for adoption of PEN card by various groups of adopters, because then only the significant & insignificant groups can be identified as well as it will help the researchers to understand the variances of intention between and within the groups. So the main research question is “*What is the difference between the intentions of various groups of PEN card adaptors?*”

A. Research Objective

In order to answer the above research question and to understand the differences of intentions among various groups, the following objective is framed:-

1. To determine any significant differences between the intentions of different groups of education card adaptors.

B. Research Methodology

The primary data was collected as part of a two-stage sampling procedure. The first step is to select the top four (4) metropolitan cities according to the total number of inhabitants. The second step is stratified random sampling. The strata include schools, colleges, universities and regulating authorities. The data was collected from the sampling units of the individual strata of each group by a random process. The sample frame consisted of the list of students, teachers and non-academic staff of each strata in each group. The final sample was measured as a representative of the population, which includes all the stakeholders of academics.

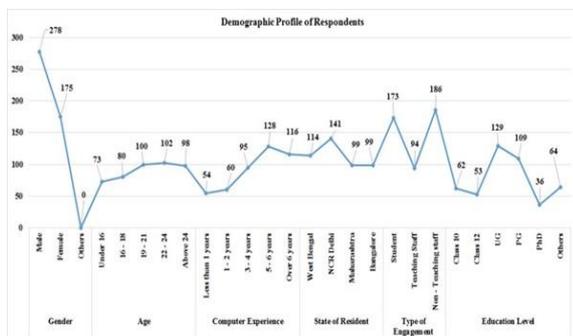
The questionnaire was primarily adopted from the Technology Adoption Model (TAM) version of Zahedi, 2006 [33]. The gathered data has been organized, tabulated, analyzed and interpreted with the help of appropriate model and statistical techniques. The analytical techniques among others include frequency calculation, Levene's test of homogeneity, one – way ANOVA and Tukey test.



IV. DATA ANALYSIS & FINDINGS

This section analyzes the results of the survey, which is used to measure the intentional differences between different groups of PEN card adopters. The study covers the four (4) major metropolises of India, namely Kolkata, Mumbai, Bangalore and NCR Delhi. To achieve the goals, responses were received from 173 students, 94 teachers and 186 non-teaching staff.

The demographic profile (see Fig. 2) can be summarized as follows: that data has been collected from 278 men and 175 women, the largest number of respondents that is 102 were in the age group of 22 - 24 years, followed by 100 respondents in the age group of 19 - 21 years. The maximum number of respondents that is 128 were in 5 - 6 years of computer experience, followed by 116 respondents with more than 6 years of computer experience. For this study, the maximum number of respondents that is 114 were from NCR Delhi, followed by 114 respondents from West Bengal. In category of engagement with the academic sector, the respondents were mainly non-teaching employees with a total of 186 people, followed by 173 respondents as students. In addition, the education level of the respondents was generally highest in UG level with a total of 129, followed by 109 in PG level.



V. COMPARISON OF INTENTIONS AMONG DIFFERENT GROUPS OF PEN CARD USERS

In this section the significant differences of intentions for adapting the education card among the different groups of adapter namely Student, Teaching Staff and Non - Teaching Staff will be tested via one - way ANOVA. The one - way ANOVA is practiced to decide is there any statistically significant differences between the means of two (2) or more independent groups. It is also important to understand that one-way ANOVA is a general test statistic; it is therefore impossible to determine which specific groups are statistically different, it can only find that at least two (2) groups were different. Therefore, the post-hoc test can be used to determine which of these groups is different.

A. Levene's Tests

The test of homogeneity of variance provides the Levene's test to examine the assumption that the population variances of all the groups are equal or not.

Table 1. Test of Homogeneity of Variances
Source: Developed by Researcher in SPSS

Intention			
Levene Statistic	df1	df2	Sig.
1.676	2	450	.188

According to the Table 1, Test of Homogeneity of Variances, the Levene's test for the current study is not significant; $F(2, 450) = 1.676, p = 0.188$, at the 0.05 alpha level, which in results allows to accept the null hypothesis and it can be concluded that the homogeneity of variance is satisfied i.e. all the groups are having same population variances.

B. One-Way ANOVA

The weighted average mean of two (2) statements has been calculated to form the final variable "Intention". The two (2) statements were "Is it beneficial if single photocopy of an education card can substitute the traditional system" and "Need for an Education Card in Indian Education System" with three (3) options coded as "1 - Beneficial, 2 - Not Sure, 3 - Not Beneficial" and "1 - Yes, 2 - Not Sure, 3 - No" respectively.

The education card adaptors are grouped under three (3) heads namely Student, Teaching Staff and Non - Teaching Staff. Thus it is need of the hour to understand particularly which group of adaptor/s is/are having statistical evidence that the associated population means are significantly different.

C. Null and Alternative Hypotheses for One-Way ANOVA

The basic null hypothesis is that the all the groups are having equal mean,

H_0 : The means of all the groups are equal i.e. $\mu_1 = \mu_2 = \mu_3$ (in this study there are three groups).

H_A : At least one group have different mean (μ) with respect to the other groups.

where,

$\mu_1 =$ Student, $\mu_2 =$ Teaching Staff, $\mu_3 =$ Non - Teaching Staff

D. Descriptives Table

According to the Table 2, Descriptives, the number of Student, Teaching Staff and Non - Teaching Staff are 173, 94 and 186 respectively, with the mean value of 1.30, 2.59 and 1.39. The total mean is 1.61 across the three (3) groups. The standard deviation of Teaching Staff (0.59) is higher than the Student (0.47) and Non - Teaching Staff (0.50), a higher standard deviation depicts that the actual data points are spread out an the distance between the mean and the actual value is big, which incurs a higher standard error too.

Table 2. Descriptives
Source: Developed by Researcher in SPSS

Intention	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
					Student	173		
Teaching Staff	94	2.5851	.58031	.05985	2.4662	2.7040	1.00	3.00
Non - Teaching Staff	186	1.3898	.49040	.03596	1.3188	1.4607	1.00	3.00
Total	453	1.6071	.70954	.03334	1.5415	1.6726	1.00	3.00

E. ANOVA

This is the specific table representing the result of the ANOVA analysis and verifying the statistically significant differences between the group means.

Table 3. ANOVA
Source: Developed by Researcher in SPSS

Intention	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	72.042	2	36.021	35.742	.021
Within Groups	453.515	450	1.008		
Total	525.557	452			

According to the *Table 3, ANOVA*, the significance value is 0.021 (i.e., $p = 0.021$), which is below 0.05 and therefore, there is a statistically significant difference in the mean Intention to adopt the education card between the different adopters. Hence, $F(2, 450) = 35.742, p = 0.021$, at the 0.05 alpha level. However, as in the current study three (3) groups (Student, Teaching Staff and Non – Teaching Staff) are present, so Tukey HSD post hoc test need to be done to understand which specific pairs of means are significantly different.

F. Multiple Comparison

From the results so far, it is clear that there are statistically significant differences between the groups as a whole. But particularly which pair of groups are having statistically significant differences are not known. The following table with multiple comparisons shows the groups that differ from each other. The Tukey Post Hoc test is usually chosen for the post hoc test of a one-way ANOVA.

According to the *Table 4, Multiple Comparisons*, there is a statistically significant difference in the intention to adopt the education card between the group of Student and the Teaching Staff ($p = 0.032$), as well as between the Non – Teaching Staff and Teaching Staff ($p = 0.020$). However, there were no differences between the groups of Student and Non – Teaching Staff ($p = 0.277$).

As the final inference it can be stated that there was a statistically significant difference between groups as determined by one –way ANOVA ($F(2, 450) = 35.742, p = 0.021$). The null hypothesis is rejected which stated that the means of all the groups are equal i.e. μ_1 (Student) = μ_2 (Teaching Staff) = μ_3 (Non – Teaching Staff). A Tukey post hoc test revealed that the intention to adopt the education card was statistically significantly higher among the Student group ($1.30 \pm 0.47, p = 0.032$) and Non – Teaching Staff group ($1.39 \pm 0.50, p = 0.020$) compared to the Teaching Staff group (2.59 ± 0.58). There was no statistically significant difference found between the Student and Non – Teaching Staff ($p = 0.277$).

Table 4. Multiple Comparisons
Source: Developed by Researcher in SPSS

Dependent Variable: Intention							
	(I) How you are attached to Education Institute?	(J) How you are attached to Education Institute?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	Student	Teaching Staff	-1.39820*	.06375	.032	-1.5481	-1.2483
		Non - Teaching Staff	-.08054	.05255	.277	-.2041	.0430
	Teaching Staff	Student	1.39820*	.06375	.032	1.2483	1.5481
		Non - Teaching Staff	1.31766*	.06296	.020	1.1696	1.4657
	Non - Teaching Staff	Student	.08054	.05255	.277	-.0430	.2041
		Teaching Staff	-1.31766*	.06296	.020	-1.4657	-1.1696

*. The mean difference is significant at the 0.05 level.

VI. CONCLUSION

One way ANOVA showed that the standard deviation of intention for adopting the education card in Teaching Staff is higher than the Student and Non – Teaching Staff. The intention to adopt the education card was statistically significantly higher among the Student group and Non – Teaching Staff group compared to the Teaching Staff group. There was no statistically significant difference found between the Student and Non – Teaching Staff groups. The present research concludes that among the three groups (students, teaching staffs and non-teaching staffs), two groups i.e. student and non – teaching staff are having an early adoption intention among them as compared to the teaching staffs. Hence, when the PEN card becomes operational higher rate of acceptance can be accepted from these two groups.

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