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Identifying Key E-Payment Parameters Using the Delphi Method for Recommendation Models in Developing Countries

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Abstract

An electronic payment system (EPS) is a technological solution that enables transactions and the purchase of goods and services without the need for physical methods like cash or checks. Small and medium-sized enterprises (Alshamaila et al.) are striving to boost their sales by adopting secure systems such as EPS. EPS is widely considered the foundation of e-commerce, playing a critical role in its growth and expansion .While it is widely acknowledged that designing E--Payment recommendation models depends on parameters linked to e-learning, there remains a lack of consensus on what these parameters precisely entail. This study endeavors to pinpoint the essential parameters for generating E--Payment recommendations, especially within developing countries. Drawing upon pertinent literature, employing the Delphi method, and collaborating with E-- Payment experts, this research identifies ten pivotal e-learning-related parameters. Notably, the findings underscore that among these parameters, "perceived ease of use" stands out as the most critical, while "user preference" emerges as the least influential factor in the realm of e-learning. Based on pertinent literature and employing the Delphi method alongside insights from E-- Payment experts, this paper delineates ten pivotal factors associated with e-learning. The findings underscore that among these parameters, perceived ease of use emerges as the most crucial, while user preference exhibits the least impact on e-learning.

Keywords: *E--Payment Systems, Developing Country, Digital Education, Models.*

Introduction

E-payment is an innovative way for boosting educational quality by leveraging digital networks. Researchers have expressed a strong interest in its potential to improve both teaching and learning. (Patra et al., 2022). Through the use of the internet, e-learning offers students a flexible learning environment by enabling them to access course materials from any internet-connected device, at any time. This flexible format is not like the traditional classroom, where teaching is usually done in a standard manner (Fikri & Muchyidin, 2022).

Recommendation models have been developed with the purpose of anticipating users' learning preferences in the context of electronic payment systems. These models are essential in assisting users in selecting the best learning resources from a variety of possibilities, hence improving their entire educational experience. These models obtain pertinent insights to offer customised E- Payment services by examining user data (E. A. Ghaleb et al., 2021; Nortvig et al., 2018).

The literature regularly examines the critical features affecting e-learning, emphasising how crucial it is to pinpoint these components in order to create recommendation models that are both successful and efficient (Al-Adwan et al., 2021). There is still no consensus over the precise nature of these characteristics, despite several attempts. A number of factors have not been fully investigated, such as website quality, learner experiences, and interface design. So, in order to develop recommendation models that are easy for users to understand, it is imperative to validate the primary elements driving E-Payment (Ali et al., 2022). This research aims to meet this need by identifying the critical components of E-Payment recommendation models, especially with the

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use of experts' opinions (Ghaleb et al., 2022). The development of more effective E-Payment recommendation systems will benefit from this knowledge (Ghaleb et al., 2022; Klašnja-Milićević et al., 2015).

Furthermore, as the adoption of electronic payments is either in its infancy or has not yet begun, emerging nations place a premium on the exploration of E-Payment elements (Liza et al., 2021). E-payments have the power to significantly reduce the cost of education and enhance skill development, which will boost competitiveness and economic growth in these sectors (Al Kurdi et al., 2020; Ghaleb et al., 2023). Nonetheless, infrastructural obstacles need to be addressed for successful implementation. It is crucial to comprehend the factors that affect E-Payment in developing countries to guarantee its effectiveness (E. A. B. Ghaleb et al., 2021). E-payments have the power to significantly reduce the cost of education and enhance skill development, which will boost competitiveness and economic growth in these sectors (Almaiah & Alyoussef, 2019).

The article explains how an electronic payment system (EPS) intended for small and medium-sized enterprises (SMEs) was validated using the Delphi approach, offering a practical substitute for traditional transaction methods like cash or checks. The research, which was published in Sustainability on March 28, 2023, used EPS for administrative purposes. This allowed for quick email correspondence and the creation of a unique landing page. In two rounds of deliberation, the Delphi approach assisted in reaching a consensus while assessing the efficacy of the model and business reputation management procedures (Shibani et al., 2023). The primary objective is to illustrate how the Delphi technique, in especially the EPS-based version, can be used to analyse intricate theoretical ideas like maturity models. The approaches consist of a study of the literature, an e-Delphi methodology modification, and a careful evaluation of the research findings. The article's structure delineates subsequent sections, commencing with an exploration of the fundamental theoretical underpinnings of the

Delphi method.

Literature Review

Various forms of Delphi research have arisen due to the growing utilization and adaptation of this method. These adaptations, including "modified Delphi," "e-Delphi," "Delphi policy," and "Real- time Delphi," exhibit diverse aims. For instance, Delphi policy centers on deliberating varied perspectives concerning the "preferred future," not necessarily aiming for consensus (Hasson & Keeney, 2011). The absence of a precise definition and the array of approaches pose challenges in methodological rigor, according to Hasson and Keeney. Rowe and Frewer advocate for clearer definitions, correlating them with improved research reliability, easier result interpretation, and greater confidence in conclusions. The uncertainties surrounding consensus importance, expert criteria, and the multitude of Delphi types contribute to the method's criticism, potentially threatening its reliability and validity (Hasson & Keeney, 2011; Kalid et al., 2024). In their pursuit of scientific rigor in Delphi research, they emphasize two key points. First, they note that replicating the Delphi method over varying time frames deviates from its core aims. Furthermore, uncontrollable factors associated with individual Delphi studies can hinder methodological rigor. For future empirical research, they recommend using parallel measures, ensuring rigor in each Delphi iteration, and combining qualitative and quantitative methods as suggested by Day and Bobeva or outlined in the mixed methods appraisal tool (MMAT) (Mullen, 2003).

Furthermore, it is critical to understand that Delphi findings are a snapshot of the professional perspectives of a particular group at a certain time, emphasising the need for validation through additional study and comparison analysis with other sources of data (Ammar et al., 2021; Cyphert

& Gant, 1971). Some suggest combining Delphi research with parallel techniques like questionnaire surveys and evaluation interviews to address methodological issues.

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The conventional Delphi research process consists of three stages: exploration, distillation, and application. The first stage, exploration, includes unstructured inquiries into domain challenges and issues, usually conducted through brainstorming sessions (Habibi et al., 2014). Establishing participant selection criteria, assembling an expert panel, and creating the necessary tools are some of the tasks involved in this phase. An updated version of the Delphi process proposes to change this step by employing a structured questionnaire in the first round, after first synthesising important topics from the body of existing literature or expert interviews (Naji et al., 2024; Velez et al., 2020).

Distillation, the second stage, comprises several rounds of analysis and consultation to determine whether the Delphi process has achieved its fundamental conclusion. The creation and dissemination of the study's final report are the main goals of the exploitation stage (Velez et al., 2020). Designing the questionnaire and choosing an expert panel are the two main Delphi issues. Given their direct influence on the validity and reliability of the results, panel size, makeup, and response rate are important factors to take into account. Customising the panel strategy according to the nature of the study and the necessary specialised expertise is standard procedure (Humphrey- Murto et al., 2017).

Following these phases, the Delphi process involves several rounds of expert consultations to evaluate its advancement (Habibi et al., 2014). The size of the panel and the pace at which consensus is reached determine how many rounds are needed. Theoretically, the Delphi procedure can go on forever until a consensus is reached, but several studies indicate that three rounds are typically sufficient. Expert panels with fewer members may agree after just one session, but two rounds are recommended to ensure feedback is verified. Up to three rounds may be required for bigger panels with more than thirty experts in order to get enough feedback (Ruano et al., 2023). The declining participation in subsequent iterations, dropping by as much as 40% in some cases, prompts a suggestion to limit rounds to maintain critical participation levels. In modified Delphi methods using pre-selected item lists, this may reduce rounds to two (Mullen, 2003).

Many authors stress that in the Delphi method, the number of rounds primarily hinges on achieving consensus; it's reaching consensus that signifies the completion of Delphi rounds, not the other way around (Isha et al., 2023; Okoli & Pawlowski, 2004; Saleem et al., 2022). This implies that theoretically, the process should persist until the preset criteria for reaching consensus

are met. However, when the Delphi method is used to develop a concept or model, the consensus pertains to individual components within that model (Raskin, 1994). In this context, consensus doesn't determine the termination of study rounds but aids in accepting or rejecting elements of the model or concept. Predetermining the number of study rounds is also logical to manage high dropout rates or prevent fatigue, especially when questionnaires include numerous items, a common feature in many Delphi studies .

The Likert scale commonly serves to collect expert opinions in qualitative research aimed at assessing the importance of specific items or screening them out, typically employing 5-point or 10-point scales (Hsu & Sandford, 2013). Typically, the 5-point Likert scale uses expressions like "strongly agree" and "strongly disagree." However, the principal criterion for choosing the Likert scale aligns with the study's purpose. Reviews by Giannarou and Zervas reveal that 10-point Likert scales are used to evaluate importance levels (indicators, factors, etc.), whereas the 5-point scale is predominant when assessing expert understanding (Markmann et al., 2021).

With the Delphi approach, data is gathered repeatedly over the course of multiple rounds until consensus is reached. Consensus, which may be evaluated either quantitatively or categorically, shows the degree of agreement among respondents about a specific idea, aspect, or concept (Drumm et al., 2022). The lack of a generally recognised scientific technique for determining consensus levels is a key shortcoming of this strategy, despite the fact that the objective is to establish a reliable consensus among expert perspectives. Different researchers will interpret Delphi research differently because different criteria—such as frequency distribution, standard deviation, interquartile range, coefficient of variation, or metrics like Kendall's W—are used to identify and build agreement (Drumm et al., 2022).

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Standard deviation is used by the Delphi method to assess consensus; normally, results less than

are accepted, as per Christie and Barela's standards. Furthermore, on a 10-point Likert scale, the interquartile range should be less than 2.5, and on a 5-point scale, it should not be greater than

This range is frequently used in conjunction with the standard deviation or median (Głuszek,

2021).

The Kendall coefficient of concordance, which has a range of 0 to 1, is used in quantitative analysis. A value of 1 denotes total unanimity, whereas a value of 0 shows a lack of consensus (Akins et al., 2005). Values higher than 0.7 often signify a high degree of agreement and provide guidance for the process's next phases. Furthermore, the coefficient of variation, which is interpreted in relation to the consistency of observations, helps assess the variability of responses (Turoff & Hiltz, 1996).

Measures of central tendency, such as mean, median, and mode, are used in delphi studies to express the respondents' aggregate opinions. In accordance with the goal of the Delphi method, which is to present convergent perspectives, the literature frequently supports the median that is obtained from the Likert scale. Some scholars argue that percentage metrics are not reliable enough and that a more reliable method would be to evaluate stability in succeeding rounds. This technique examines the consistency of respondents' votes over rounds and accounts for departures from the average. Changes below 15% are indicative of consensus, according to stability thresholds, and can be used as a criterion to end the Delphi cycles (Von Der Gracht, 2012; Zartha Sossa et al., 2019).

Using a variety of metrics, including the interquartile range, standard deviation, and the proportion of respondents in certain categories, is a suggested best practice for confirming agreement. This method addresses situations where individual measures may meet established thresholds yet do not successfully reflect expert consensus (Alzoraiki et al., 2023; Zartha Sossa et al., 2019). The basic idea behind the Delphi approach is to refine expert viewpoints over several rounds, led by group input, in order to establish consensus. Controlled input Surveys are a feature of every round that allow experts to modify their assessments based on statistical summaries, comments, rankings, and subjective input. This process of iteration continues until certain standards of agreement or stability are met.

Influential Factors for EPS and E-Payment Models: Adoption and Impact

Technology, Organisation, Environment, and Security, or TOES variables, have a major role in influencing the adoption of Electronic Payment Systems (EPS) and influencing how well E- Payment Recommendation Models work. The necessity of robust infrastructure and user-friendly e-payment platforms is emphasised by technological factors. The performance of recommendation models is significantly impacted by organisational factors, including resistance to change and organisational structure. Leadership support is especially important in this regard. An important role that external environmental variables like market trends and regulatory requirements play in the adoption of E-Payment and EPS recommendation models. Furthermore, user approval depends on security factors pertaining to cyberthreats and data protection. Both the EPS and E-Payment Recommendation Models are seen to benefit from the effective incorporation of these TOES elements, which is deemed to need a careful review and a strategic approach.

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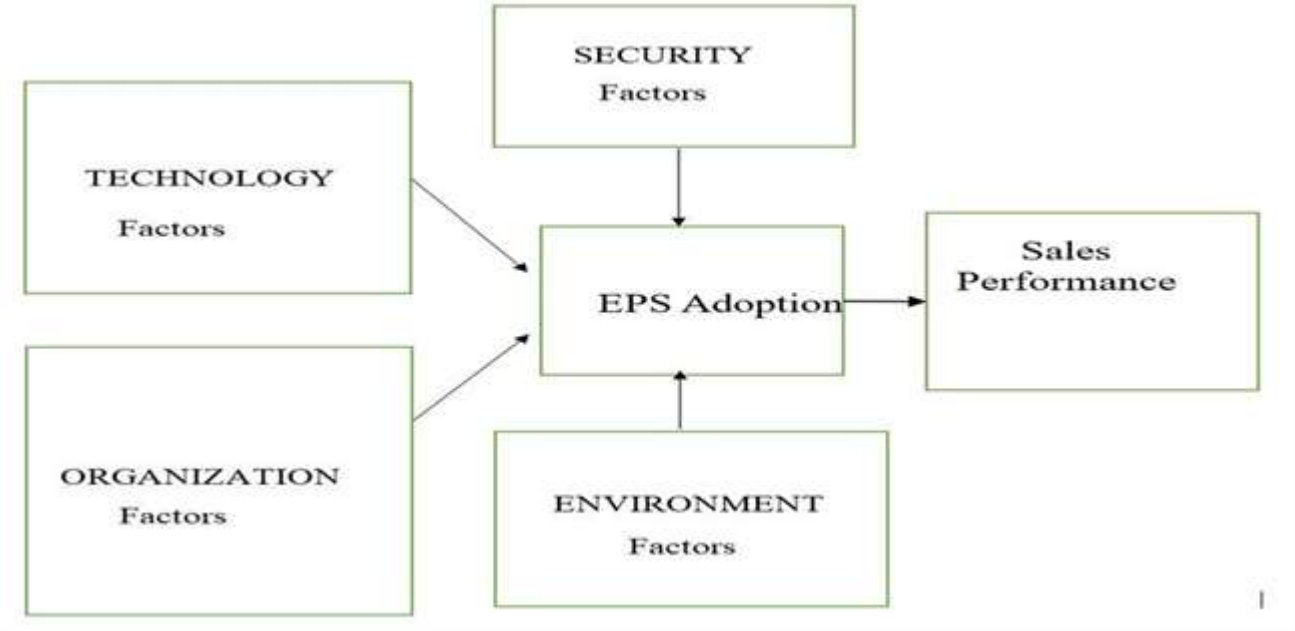

Figure 1. Proposed Theoretical Model

Methodology

The Delphi method, a systematic and iterative research strategy used in higher education research, is applied in this study. The process entails the methodical collection and amalgamation of specialized insights and evaluations pertaining to the principal factors that impact an electronic payment recommendation model. The strategy, which usually involves three study rounds, involves anonymously consulting experts to gather their perspectives, especially when dealing with complicated or ambiguous issues that need in-depth investigation. The main goal of the Delphi method is for experts to come to a consensus and improve knowledge of important parameters by going through many rounds gathering information, encouraging agreement through comments, and compiling the findings into a final report. The Delphi method is a systematic means to gather and refine views for informed decision-making or additional study. It is particularly beneficial for leveraging the collective experience of professionals in subjects characterised by ambiguity or inadequate empirical evidence. Its flexibility is a big plus since it lets you adjust the number of experts and iterations according to how complicated the topic is.

Structure of Questionnaires

This study's questionnaire was carefully designed over the course of three primary phases, with input from (Sekaran & Bougie, 2016). Creating precise and succinct questions is the primary focus of the first phase. Next comes strategic planning for the variables' classification, scaling, and coding. The last stage is on the questionnaire's general design, as seen in Figure 1. It includes 76 items total, broken down into three parts that represent the 10 components of the research model. These variables, which are based on accepted theories, prior research, and the circumstances of the study, include the uptake of Electronic Payment Systems (EPS), sales performance, and respondent demographic data (Ghaleb et al., 2023). The questionnaire starts with an introduction section that directs respondents in submitting their responses to promote clarity. Five specialists proofread the final draft and based on their comments—especially with regard to the measuring items—we refine them.

Stage 1, also known as the principles of language, focusses on key elements such question kinds, logical sequencing, content alignment with hypotheses, personal data considerations, and clarity in language. Phase 2, referred to as the principles of measuring, include crucial duties including verifying that the data gathered is suitable, creating coding systems, choosing measuring scales (like Likert scales), and carrying out validity

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and reliability assessments. In the third and final stage, the appearance and length of the questionnaires are evaluated, a suitable introduction is written, instructions are made plain, thorough validity and reliability evaluations are carried out, a pilot research is carried out, and the questionnaire administration is carefully planned. Together, these phases offer a methodical and complete approach to creating a research questionnaire that is well-structured and guarantees a complete methodology from the formulation of preliminary questions to the efficient administration of the completed questionnaire.

Results

The goal of the Delphi survey used in this study was to get experts to agree on the components of the reputation management maturity model, particularly as they relate to the adoption of EPS to boost sales in SMEs in developing nations (Gluszek, 2021). Over the course of nine months and through three rounds, the study aimed to validate and evaluate the model's appropriateness for expert assessment using a modified Delphi technique (Murphy et al., 1998). The study addressed the difficulties in managing one's reputation when there is a lack of empirical support, which is in line with the benefits of the Delphi approach (Turoff & Hiltz, 1996).

The improvement of reputation management procedures within a maturity model was one of the main objectives of the Delphi research on EPS adoption. Experts sought to verify and evaluate the significance of these practices in the model, aiming to develop a self-assessment tool for gauging a company's reputation management maturity level. This goal was in accordance with the study's purpose of streamlining the assessment of reputation management strategies to increase efficacy. In addition, the Delphi method—which included an extensive literature study and expert assessments—was employed to identify the variables influencing the adoption of EPS. Ten crucial components were found in the latter stage of the Delphi procedure, providing a targeted knowledge of the variables influencing EPS adoption in SMEs.

Table 1. Characteristics of the Expert Panel

No	Factor	Stage1 Expert Selection	Stage2 Expert Selection	Stage3 Expert Selection	Dimension
1	Compatibility	√	√	√	Technological
2	usefulness	√	√	√	
3	Ease of use	√	√	√	
4	Facilitating conditions				
5	Privacy				
6	Availability				
7	Reliability				
8	Physical location				
9	Complexity	√	√		
10	Data quality	√	√		
11	Technical support	√	√		
12	Technical resources	√			
13	IT Infrastructure	√			
14	Perceived size	√			
15	Familiarity with the web	√			
16	Perceived ease of use	√			
17	Perceived Risk	√			
18	Personal experience with EPS	√			
19	System quality	√	√		
20	Technical protections	√			
21	Interoperability				
22	Transaction procedures				
23	Simplicity				
24	Size	√		√	

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25	Top management support	√	√	√	
26	Organization budget				
27	COST	√	√	√	
28	Facilitating conditions				
29	Policy				
30	Privacy	√			
31	Availability				
32	Reliability				
33	Physical location				
35	Data quality	√			
36	Engagement	√			
37	Financial support	√	√		
38	Change Management	√	√		
39	Organization readiness	√	√		
40	Organizational culture	√			
41	IT knowledge capability				
42	Discipline	√	√		
43	Positive attitude	√	√		
44	User Satisfaction	√	√		
45	Management knowledge about system				
46	Trust	√		√	
47	Technological Changes	√			
48	Social norms	√			
49	Economic conditions				
50	Competitive Environment				
51	Regulatory Environment				
52	Technological Changes	√			
53	Environmental Considerations	√	√		
54	Physical environment	√			
55	Customer pressure	√	√	√	
56	Coercive pressure from clients				
57	Privacy	√		√	
58	Perceived security	√	√	√	
59	Availability	√			
60	Reliability	√			
61	Complexity	√			
62	Data quality	√	√		
63	Perceived privacy	√	√		
64	Transaction security	√			
65	Security statements	√	√		
66	Data theft				
67	User and device authentication				
68	Privacy concerns				
69	Lack of Awareness				

Delphi Study

Following an extensive assessment of the literature from April 2020 to December 2020, 69 criteria related to information systems and electronic payments were compiled (refer to Appendix B). After then, ten subject-matter experts were asked to participate in the investigation. During the initial selection phase, 44 factors were identified, and the experts were asked to evaluate their significance based on their professional knowledge and experience. The list of 22 significant variables that are linked to SMEs' use of electronic payment systems (EPS) was further reduced in the second phase. Following a final step in which the experts were charged with ranking the most important aspects that impact adoption and reinforce the study's model, ten crucial criteria were identified and are described in depth in Table 2. Critical success factor.

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Table 2. Critical Success Factors

Factor	Dimension
Compatibility	Technological
usefulness	
Ease of use	
Size	Organizational
Top management support	
Cost	
Trust	
Customer pressure	Environmental
Privacy	
Perceived security	security

Expert Profile and Qualifications

This section provides a detailed examination of a table that profiles ten experts (E1 to E10) who took part in a study or consultation on the uptake and consequences of E-Payment Recommendation Models and Electronic Payment Systems (EPS). Giving readers a complete picture of the backgrounds and credentials of the experts is the goal. The initial column, designated as "Expert (E1 to E10)," functions as a distinct identity for every person, emphasising their capacity to offer significant perspectives, judgements, or knowledge pertaining to the study subject.

The table's subsequent columns provide each expert with more context. The ages of the participants are listed in the "Age" column, which might offer demographic insights and draw attention to any potential generational variations in the replies. The "Education Level" column lists each expert's educational background, highlighting the range of viewpoints that result from their academic training. The experts' duties or job titles are described in the "Position" column. These jobs may be managerial in information systems, records management, software management, or information and communication technology (ICT). Last but not least, the "Experience" column lists all of the years of professional experience that each expert has, which is a crucial component in determining the breadth of knowledge and insights they bring to the research or consultation.

Table 3. Provides Information Expert Validation

Expert	Age	Education Level	Position	Experience
E1	49	BSc	ICT Senior Manager	25
E2	37	Master	IS Manager	14
E3	42	PhD	Field IT Manager	16
E4	34	BSC	IS supervisor	11
E5	39	BSC	Records Manager	13
E6	50	Master	IT/IS superindent	26
E7	41	Diploma	Archive Manager	17
E8	39	BSc	Software Manager	12
E9	40	BSc	IT Manager	16
E10	47	BSc	Field ICT Supervisor	11

Conclusions

In summary, this study has made significant strides towards identifying critical factors that affect e-learning, particularly when it comes to developing nations, by conducting a thorough literature analysis and expert evaluations utilising the Delphi approach. The findings identify 10 critical elements that have a major impact

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on the state of e-payments. Notably, the idea of "perceived ease of use" became apparent as a crucial component, emphasising the need for E-payment systems that are easy to use in various contexts. In the future, we hope to further our study collaboration with experts from other developing nations, improve the factors that have been found, and validate the suggested recommendation model. We also want to refine our results via student surveys and real- world implementations, which will support the continuous advancement of E-Payment recommendation systems that provide more efficient and customised learning environments.

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Institutional Review Board Statement

Not applicable.

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