



Mansoureh Shariati

Sarcheshmeh<sup>1</sup>,  
Sareh Dashti<sup>2</sup>, Leili  
Mosalejad<sup>3</sup>,  
Malihe Rezvani  
Fard<sup>4</sup>, Tahereh Fathi  
Najafi<sup>2,4,\*</sup><sup>1</sup>Department of  
Midwifery, Ne.C.,Islamic Azad  
University,

Neyshabur, Iran

<sup>2</sup>Department of  
Nursing and  
Midwifery,MMS.C., Islamic  
Azad University,

Mashhad, Iran

<sup>3</sup>Medical Education  
Department, Virtual  
Center, JahromUniversity of  
Medical Sciences,

Jahrom, Iran

<sup>4</sup>Department of  
Medical Education,  
Smart University of  
Medical Sciences,

Tehran, Iran

\*Department of  
Nursing and  
Midwifery,MMS.C., Islamic  
Azad University,

Mashhad, Iran.

Bazarcheh Sarab, Dr  
Mohammad  
Shahinfar MedicalUniversity,  
Mashhad,  
9137635567Iran  
Department of  
Medical Education,  
Smart University of  
Medical Sciences,Tehran,  
Iran  
Tel:

+989151002246

Email:  
fathinajafi@iau.ac.ir

### The Psychometrics Properties of the Iranian Smartphone Application in Midwifery Education Based on Rogers' Diffusion of Innovation Theory: A Confirmatory Factor Analysis Study

**Background:** The rapid growth of smartphone use has encouraged the adoption of innovative approaches in medical education. The aim of this study was to design and psychometrically validate a measurement model for the Smart Screening System "Screen App" based on the constructs of Rogers' Diffusion of Innovation Theory using confirmatory factor analysis (CFA) among midwifery students.

**Method:** This cross-sectional study was conducted among undergraduate Midwifery students of Islamic Azad University of Mashhad in 2023-2024. Data were collected using a researcher-made questionnaire designed based on the five constructs of Rogers' diffusion of innovation theory. The content validity of the instrument was confirmed by 13 medical education experts and four Midwifery students. Students received detailed instructions and a 3-7 day familiarization period before completing the questionnaire.

**Results:** Quantitative face validity was evaluated using the Item Impact Score. The results indicated that no items required removal at this stage. Subsequently, content validity was assessed using the Content Validity Ratio (CVR) and the Content Validity Index (CVI). The minimum acceptable values for CVR and CVI were set at 0.54 and 0.70, respectively. CFA confirmed the good fit of the five-construct model includes the Chi-square/degrees of freedom ratio ( $\chi^2/df = 1.49$ ), Comparative Fit Index (CFI = 0.93), Tucker-Lewis Index (TLI = 0.92), Incremental Fit Index (IFI = 0.94) and Root Mean Square Error of Approximation (RMSEA = 0.06) within the Intelligent Screening Application (ISA) system, supporting the theoretical structure.

**Conclusion:** "The Screen App", as an innovative educational tool, may facilitate deeper learning and exert a significant educational impact on students, by incorporating the essential characteristics of innovation.

**Keywords:** Midwifery students, Diffusion of Innovation theory, Mobile smartphone applications

الخصائص السيكومترية لتطبيق الهاتف الذكي الإيراني في تعليم القبالة بناءً على نظرية روجرز لانتشار الابتكار: دراسة تحليلية عاملية تأكيدية

**الخلفية:** شجع النمو السريع لاستخدام الهواتف الذكية على تبني مناهج مبتكرة في التعليم الطبي. هدفت هذه الدراسة إلى تصميم نموذج قياس لنظام الفحص الذكي "Screen App" والتحقق من صحته سيكومترياً، استناداً إلى مفاهيم نظرية روجرز لانتشار الابتكار، باستخدام التحليل العاملي التأكيدي (CFA) بين طالبات القبالة.

**الطريقة:** أجريت هذه الدراسة المقطعية على طالبات القبالة في جامعة آزاد الإسلامية في مشهد خلال العام الدراسي ٢٠٢٣-٢٠٢٤. جُمعت البيانات باستخدام استبيان من إعداد الباحث، مصمم بناءً على المفاهيم الخمسة لنظرية روجرز لانتشار الابتكار. تم التحقق من صحة محتوى الأداة من قبل ١٣ خبيراً في التعليم الطبي وأربع طالبات في القبالة. تلقت الطالبات تعليمات مفصلة وفترة تعريفية تتراوح بين ٣ و٧ أيام قبل إكمال الاستبيان.

**النتائج:** تم تقييم الصلاحية الظاهرية الكمية باستخدام درجة تأثير البند. أشارت النتائج إلى عدم وجود بنود تستدعي الحذف في هذه المرحلة. بعد ذلك، تم تقييم صلاحية المحتوى باستخدام نسبة صلاحية المحتوى (CVR) ومؤشر صلاحية المحتوى (CVI). حُدثت القيم الدنيا المقبولة لـ CVI و CVI عند ٠.٥٤ و ٠.٧٠، على التوالي. أكد التحليل العاملي التوكيدي (CFA) جودة ملائمة نموذج العناصر الخمسة، بما في ذلك نسبة مربع كاي إلى درجات الحرية ( $\chi^2/df = 1.49$ )، ومؤشر الملاءمة المقارن ( $CFI = 0.93$ )، ومؤشر تاكر-لوييس ( $TLI = 0.92$ )، ومؤشر الملاءمة التزايد (IFI = 0.94)، وجذر متوسط مربع خطأ التقريب ( $RMSEA = 0.06$ ) ضمن نظام تطبيق الفحص الذكي (ISA)، مما يدعم البنية النظرية.

**الخلاصة:** قد يسهم تطبيق "الفحص"، كالأداة التعليمية مبتكرة، في تعزيز التعلم العميق وإحداث تأثير تعليمي كبير على الطلاب، من خلال دمج الخصائص الأساسية للابتكار. الكلمات المفتاحية: طالبات التوليد، نظرية انتشار الابتكار، تطبيقات الهواتف الذكية

مؤلفون: ايجو كيشن مين إيراني اسمارت فون ايبيلي كيشن كي سائيكو ميترس پراپريز راجرز كي ذفيون آف انووشن تهيوري پر ميني: ايك تصديقي عنصر تجزيه مطلعہ

پس منظر: اسمارت فون کے استعمال کی تیز رفتار ترقی نے طبی تعلیم میں اختراعی طریقوں کو اپنانے کی حوصلہ افزائی کی ہے۔ اس مطالعے کا مقصد مڈوائفری طلباء میں تصدیقی عنصر تجزیہ (CFA) کا استعمال کرتے ہوئے راجرز کے ڈیفیوژن آف انویشن تھیوری کی تعمیر پر مبنی اسمارت اسکریننگ سسٹم "اسکرین ایپ" کے لیے ایک پیمائشی ماڈل کو ڈیزائن اور نفسیاتی طور پر درست کرنا تھا۔

**طریقہ:** یہ کراس سیکشنل مطالعہ ۲۰۲۳-۲۰۲۴ میں مشهد کی اسلامی آزاد یونیورسٹی کے انڈرگریجویٹ مڈوائفری طلباء کے درمیان کیا گیا تھا۔ ڈیٹا ایک محقق کے ذریعے تیار کردہ سوالنامے کا استعمال کرتے ہوئے اکٹھا کیا گیا تھا جو راجرز کے نظریہ جدت کے پھیلاؤ کی پانچ تعمیرات پر مبنی تھا۔ آلے کے مواد کی درستگی کی تصدیق طبی تعلیم کے ۱۳ ماہرین اور مڈوائفری کے چار طلباء نے کی۔ طلباء کو سوالنامہ مکمل کرنے سے پہلے تفصیلی ہدایات اور ۳-۷ دن کی واقفیت کی مدت ملی۔

**نتائج:** آئٹم امپیکٹ سکور کا استعمال کرتے ہوئے مقداری چہرے کی درستگی کا جائزہ لیا گیا۔ نتائج نے اشارہ کیا کہ اس مرحلے پر کسی بھی آئٹم کو ہٹانے کی ضرورت نہیں ہے۔ اس کے بعد، مواد کی درستگی کا اندازہ مواد کی درستگی کا تناسب (CVR) اور مواد کی درستگی انڈیکس (CVI) کا استعمال کرتے ہوئے کیا گیا۔ CVI اور CVI کے لیے کم از کم قابل قبول قدریں بالترتیب ۰.۵۴ اور ۰.۷۰ پر سیٹ کی گئی تھیں۔ CFA نے تصدیق کی کہ پانچ کنسٹرکٹ ماڈل کے اچھے فٹ ہونے میں آزادی کا تناسب ( $\chi^2/df = 1.49$ )، تقابلی فٹ انڈیکس ( $CFI = 0.93$ )، نکر-لیوس انڈیکس ( $TLI = 0.92$ )، Ereotrrquan Incremental Fit Index (IFI) = 0.94 کا ایس (IFI) اور ۰.۰۶ RMSEA = 0.06 انٹیلیجنٹ اسکریننگ ایپلی کیشن (ISA) سسٹم کے اندر، نظریاتی ڈھانچے کی حمایت کرتا ہے۔

**نتیجہ:** "اسکرین ایپ"، ایک اختراعی تعلیمی ٹول کے طور پر، جدت کی ضروری خصوصیات کو شامل کر کے، گہرائی سے سیکھنے کی سہولت فراہم کر سکتی ہے اور طلباء پر ایک اہم تعلیمی اثر ڈال سکتی ہے۔

**کلیدی الفاظ:** مڈوائفری طلباء، نظریہ جدت کا پھیلاؤ، موبائل اسمارت فون ایپلی کیشنز

ویژگی‌های روان‌سنجی برنامه کاربردی گوشی هوشمند ایرانی برای آموزش مامایی بر اساس نظریه اشاعه نوآوری راجرز: یک مطالعه تحلیل عاملی تأییدی

**زمینه و هدف:** رشد سریع استفاده از تلفن‌های هوشمند پذیرش رویکردهای نوآورانه در آموزش پزشکی را تشویق کرده است. هدف از این مطالعه طراحی و اعتبارسنجی روان‌سنجی یک مدل اندازه‌گیری برای «برنامه کاربردی غربالگری» سیستم غربالگری هوشمند بر اساس سازه‌های نظریه اشاعه نوآوری راجرز با استفاده از تحلیل عاملی تأییدی (CFA) در بین دانشجویان مامایی بود.

**روش:** این مطالعه مقطعی در بین دانشجویان مقطع کارشناسی رشته مامایی دانشکاه آزاد اسلامی مشهد در سال ۱۴۰۲-۱۴۰۳ انجام شد داده‌ها با استفاده از پرسشنامه محقق ساخته که بر اساس پنج سازه نظریه اشاعه نوآوری راجرز طراحی شده بود جمع‌آوری شدند. اعتبار محتوایی ابزار توسط ۱۳ متخصص آموزش پزشکی و چهار دانشجوی مامایی تأیید شد. دانشجویان قبل از تکمیل پرسشنامه دستورالعمل‌های دقیق و یک دوره آشنایی سه تا هفت روزه دریافت کردند.

**یافته‌ها:** اعتبار صوری کمی با استفاده از امتیاز تأثیر آیتم ارزیابی شد در این مرحله هیچ آیتمی نیاز به حذف نداشت. سپس، اعتبار محتوا با استفاده از نسبت اعتبار محتوا (CVR) و شاخص اعتبار محتوا (CVI) ارزیابی شد. حداقل مقادیر قابل قبول برای CVI و CVR به ترتیب ۰/۵۴ و ۰/۷۰ تعیین شد. تحلیل عاملی تأییدی (CFA)، برازش خوب مدل پنج سازه‌ای را در سیستم اپلیکیشن غربالگری هوشمند (ISA) تأیید کرد؛ شامل نسبت کای اسکور به درجه آزادی ( $\chi^2/df = 1.49$ )، شاخص برازش مقایسه‌ای ( $CFI = 0.93$ )، شاخص تاکر-لویس ( $TLI = 0.92$ )، شاخص برازش افزایشی ( $IFI = 0.94$ ) و جذر میانگین مربعات خطای تقریبی ( $RMSEA = 0.06$ ) که همه ساختار نظری را تأیید کردند.

**نتیجه‌گیری:** برنامه کاربردی غربالگری به عنوان یک ابزار آموزشی نوآورانه می‌تواند با گنجاندن ویژگی‌های اساسی نوآوری، یادگیری عمیق‌تر را تسهیل کرده و تأثیر آموزشی قابل توجهی بر دانشجویان داشته باشد.

**واژه‌های کلیدی:** دانشجویان مامایی، نظریه انتشار نوآوری راجرز، برنامه‌های کاربردی تلفن همراه

## INTRODUCTION

Education based on innovative methods has become a necessity today in academic setting. The widespread use of smartphones and the increasing desire of youth towards using smart devices are among the most important reasons for this necessity becoming a need (1). The advantages of e-learning and educational applications on mobile phones over traditional education methods include the absence of educational barriers, high flexibility, no time restrictions for learning, and low cost (2-4).

In the field of midwifery, education on disease screening methods—especially screening tests during pregnancy—presents particular challenges due to the number, complexity, and diversity of the tests involved. Therefore, applying diverse and interactive learning methods is crucial for effective training in this area. Early diagnosis and prevention of chromosomal and congenital disorders, particularly during pregnancy and early infancy, are vital components of maternal and neonatal health. Universities play a pivotal role in training midwifery students to accurately perform and interpret screening procedures. Among the most important screening tests that midwifery students must master are pregnancy screening, neonatal thyroid screening, and prostate screening in men, as well as the ability to manage abnormal results effectively (5-7). Pregnancy screenings, neonatal thyroid screening, and prostate screening in men are among the most important screening tests that midwifery students must become familiar and be able to manage the abnormal results (5-7). Today, there is no alternative to using smart tools for success in education, as these tools have high penetration in daily life (7).

Although several instruments and frameworks have been developed to evaluate educational technologies for health professions education, these tools primarily assess technology acceptance, usability, intention to use, or user satisfaction (8-12). To our knowledge, no instrument specifically evaluates the innovation attributes of a mobile-based screening education application for midwifery students based on Rogers' Diffusion of Innovation theory.

Evaluating the innovative aspects of this application can help identify its strengths and weaknesses, as well as the technical and cultural infrastructures required for its widespread implementation in undergraduate midwifery education. Innovations and new educational approaches are continually developed; however, due to inadequate dissemination and improper implementation, many innovations may encounter challenges in practice, fail to be adopted, or demonstrate limited effectiveness even when implemented. Successful adoption and implementation of an innovation depend on the

extent to which it possesses the characteristics and attributes identified by Rogers (12).

As a general principle, the greater the number of key innovation attributes embodied in an innovation, the greater its rate and depth of diffusion (5). According to Rogers' Diffusion of Innovations Theory (1983), a substantial proportion of the variance in the adoption and diffusion of an innovation can be explained by five key attributes: relative advantage, compatibility, complexity (or ease of use), observability, and trialability (8-10). These constructs were therefore used as the conceptual foundation for developing and validating the present instrument.

The "Screen App" is a smart guide that includes screening tests in the first and second trimesters of pregnancy; diabetes screening, thyroid disorders, cardiomyopathy, thromboembolism, neonatal screening, some calculations, neonatal anthropometry, prostate screening, and colorectal cancer screening.

As a rule, according to Rogers' Diffusion of Innovations Theory, the greater the number of key innovation attributes embodied in an innovation

Rogers' Diffusion of Innovation theory was selected as the theoretical framework because it is one of the most widely used and empirically validated theories for explaining how innovations are adopted and disseminated within social systems. The theory provides a comprehensive framework for assessing users' perceptions of an innovation through five key attributes that have consistently been shown to influence adoption decisions. Accordingly, it offers a strong theoretical basis for evaluating the innovative potential of educational technologies such as the Screen App.

Therefore, the present study was undertaken to evaluate these five attributes in the Intelligent Screening Application (ISA) as an educational innovation, based on Rogers' Diffusion of Innovations Theory. The aim of this study was to design and psychometrically validate a measurement model for the Smart Screening System (ISA) "Screen App" based on the constructs of Rogers' Diffusion of Innovation Theory using Confirmatory Factor Analysis (CFA) among midwifery students.

## METHODS

This study was conducted in several stages. The type of study in terms of objective was applied research, and was cross-sectional in terms of implementation method. All methods were performed in accordance with the relevant STROBE checklist.

All stages of design, construction, and graphical of this application were carried out by the corresponding author. To avoid conflicts of interest, this author did not provide any intervention or opinion to the authors and participants during the

implementation process and was blind to any intervention until the analysis of results.

#### *Study population and sampling*

This study was conducted among midwifery students at the Medical Sciences Branch of Islamic Azad University, Mashhad, Iran, during the 2023–2024 academic year. The study population included 317 midwifery students who had registered to receive the ISA and installed it on their Android phones, but 193 Midwifery students completed all subjects. Considering the possibility of dropouts, all students were included in the study based on census sampling. The inclusion criteria were giving informed consent to participate in the study and being registered at least in the 5th semester of Bachelor's in midwifery. The exclusion criterion was not returning the questionnaire within the specified period.

#### *Data collection procedure*

Initially, a channel, named "Screen App", was created on the Telegram channel to communicate with the participants. After joining the channel, participants were instructed on how to register and install the software. The participants were given three days to familiarize themselves with the software and its use. This time was extended to seven days based on the participants' request.

Subsequently, a researcher-made questionnaire was designed to evaluate the ISA. The instrument was based on the five constructs of Rogers' Diffusion of Innovations Theory and consisted of 51 items. The questionnaire items were developed according to Rogers' five innovation attributes, namely relative advantage, compatibility, complexity, observability, and trial ability, and were informed by previous studies conducted on similar educational software applications (10, 12). All items were rated using a five-point Likert scale ranging from "strongly agree" to "strongly disagree."

#### **Validity assessment**

##### *Face validity*

In the next step, the validity and reliability of the questionnaire were evaluated. Face validity was examined qualitatively by 13 health education specialists and 4 members of the target group. After minor modifications, the face validity of the questionnaire was confirmed. For quantitative face validity, the impact score index was used, and items with an impact score equal to or greater than 1.5 were considered appropriate. As all items were scored above 1.5, no items were excluded at this stage.

##### *Content validity*

The Content Validity Ratio (CVR) and Content Validity Index (CVI) were used to evaluate content validity. The cut-off for acceptable CVR and CVI were 0.54 and 0.7, respectively. The CVI and CVR were also evaluated based on the opinion of the 13 faculty members of the Mashhad University of

Medical Sciences.

The initial questionnaire was comprised of five constructs of the Diffusion of Innovation theory (total of 51 items). As a result, the final questionnaire contained 28 items distributed across the five constructs as follows:

- Relative advantage (5 items)
- Compatibility (5 items)
- Simplicity (8 items)
- Observability (5 items)
- Trial ability (5 items)

#### *Construct (structural) validity*

In the next step, the structural validity of the questionnaire was examined based on the specific constructs of the Diffusion of Innovation theory using confirmatory factor analysis (CFA). The Analysis of Moment Structures (AMOS) software version 17, was used to perform CFA. Factor loadings between 0.40 and 0.60 were considered acceptable, while values greater than 0.60 were considered highly desirable. Model fit indices such as the Chi-square/degrees of freedom ( $\chi^2/df$ ) ratio, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) were used to assess the adequacy of the model.

## **RESULTS**

Table 1 and Figure 1 show the initial CFA model resulting from the questionnaire items.

The result of the CFA showed that the standardized factor loadings of all items except for 6 items, including items number 11, 17, 20, 22, 23, 24, were greater than 0.4. The 6 items with lower standardized factor loading were removed from the final questionnaire. Table 2 and Figure 2 show the final model results.

After fitting the model, the goodness-of-fit indices are placed in the table below. Considering all indices, the above model was confirmed.

The results of the confirmatory factor analysis (CFA), indicate that the measurement model demonstrates a satisfactory fit to the observed data (Table 2).

The results of the reliability are shown in Table 3. The constructs of Relatedness, Compatibility, and Simplicity demonstrate satisfactory internal consistency, with Cronbach's alpha and Composite Reliability (CR) values exceeding or approaching the recommended threshold of 0.70. In particular, Simplicity exhibits the highest level of reliability ( $\alpha = 0.88$ , CR = 0.88), suggesting strong internal consistency among its measurement items (Table 3).

## **DISCUSSION**

This study aimed to evaluate the innovative aspects of the "Screen App" screening system based on

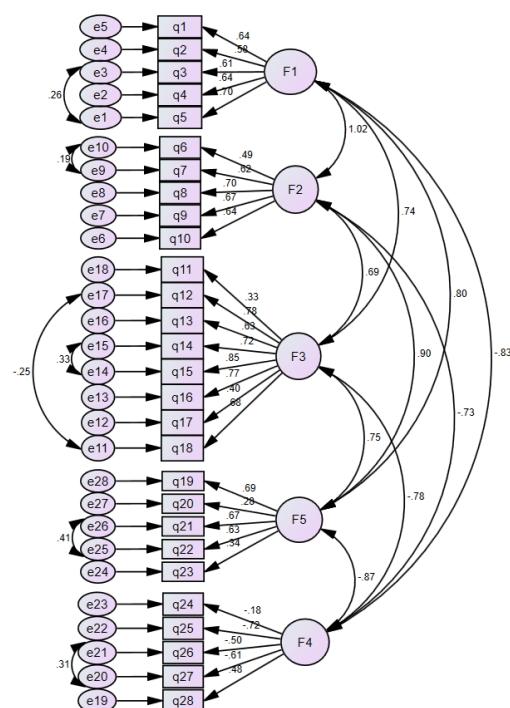
**Table 1. Factor loading values of the questionnaire items**

| Item Number   | Item | Factor Loading |
|---------------|------|----------------|
| Relatedness   | 1    | 0.64           |
| Relatedness   | 2    | 0.58           |
| Relatedness   | 3    | 0.61           |
| Relatedness   | 4    | 0.64           |
| Relatedness   | 5    | 0.7            |
| Compatibility | 6    | 0.48           |
| Compatibility | 7    | 0.61           |
| Compatibility | 8    | 0.71           |
| Compatibility | 9    | 0.67           |
| Compatibility | 10   | 0.64           |
| Simplicity    | 12   | 0.76           |
| Simplicity    | 13   | 0.63           |
| Simplicity    | 14   | 0.73           |
| Simplicity    | 15   | 0.86           |
| Simplicity    | 16   | 0.78           |
| Simplicity    | 18   | 0.69           |
| Observability | 19   | 0.69           |
| Observability | 21   | 0.63           |
| Trial ability | 25   | 0.72           |
| Trial ability | 26   | 0.51           |
| Trial ability | 27   | 0.62           |
| Trial ability | 28   | 0.45           |

**Table 2. Model fit indices in confirmatory factor analysis**

| Index Name    | Obtained Value | Acceptable Value | Result     |
|---------------|----------------|------------------|------------|
| Chi-square/df | 1.49           | Between 1 to 5   | Acceptable |
| CFI           | 0.93           | Greater than 0.9 | Acceptable |
| TLI           | 0.92           | Greater than 0.9 | Acceptable |
| IFI           | 0.94           | Greater than 0.9 | Acceptable |
| RMSEA         | 0.06           | Less than 0.08   | Acceptable |

CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, IFI = Incremental Fit Index, RMSEA = Root Mean Square Error of Approximation

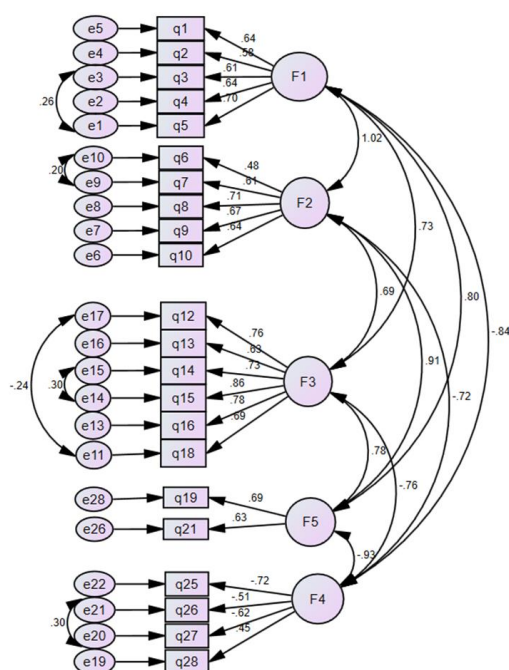
**Figure 1. Initial Confirmatory Factor Analysis model resulting (e: Error, q: Question, F: Factor)****Table 3. Assessment of Construct Reliability and Convergent Validity**

| Construct     | Alpha | AVE  | CR   |
|---------------|-------|------|------|
| Relatedness   | 0.78  | 0.40 | 0.77 |
| Compatibility | 0.77  | 0.39 | 0.76 |
| Simplicity    | 0.88  | 0.55 | 0.88 |
| Observability | 0.61  | 0.44 | 0.61 |
| Trial ability | 0.60  | 0.34 | 0.68 |

AVE = Average Variance Extracted, CR = Composite Reliability

Rogers' Diffusion of Innovation Theory, and the five constructs of the questionnaire were confirmed using a CFA model. The CFA showed that, of the 28 items designed to evaluate Rogers' innovation attributes of the "Screen App" application, 22 items were confirmed and retained in the final measurement model. From a psychometric perspective, the CFA results supported the proposed five-factor structure, indicating that the instrument appropriately reflects the theoretical dimensions of Rogers' model.

Innovation is the key to the main success for the expansion of smart tools, defined as new technical products or new technical tools that potentially facilitate problem-solving (13, 14). In the present study, innovation was operationalized through five key attributes proposed by Rogers, which served as



**Figure 2: Final Model of Confirmatory Factor Analysis**  
(e: Error, q: Question, F: factor)

the conceptual foundation for instrument development and validation.

The use of smart systems for midwifery training before entering the clinical field is especially important at the undergraduate level, leading to improved quality of care. A study by Szara et al. (2023) in India showed that the most important characteristics of smart systems for educational purposes were usefulness and practicality, which could have broader applicability in developing countries as auxiliary tools to improve the quality of care (9). These findings are consistent with those of the present study, in which perceived relative advantage and compatibility demonstrated relatively strong factor loadings, indicating their importance in users' perceptions of the innovation. Although apps have found extensive use as educational tools in medical sciences today, it is important to consider the conditions of innovation and the quality of the applications for educational effectiveness. Evaluating the advantages and limitations of apps before their expansion should be considered essential. A systematic review and meta-analysis conducted by Dickinson et al. (2020) showed that of the 21 apps designed for surgical education clustered into 8 categories, only three categories were methodologically and educationally validated (15). Similarly, the present study highlights the importance of rigorous psychometric evaluation before the widespread implementation of educational technologies.

While the design and appearance of educational apps can affect educational effectiveness and acceptance, the expansion of app use is not solely dependent on design factors. Menon (2022) showed that aspects such as ease of use, innovation, engagement, and activity were among the most important characteristics of educational apps, especially during the COVID-19 pandemic (16). The "Screen App" possesses several of these characteristics. In the present study, the simplicity (ease of use) construct demonstrated the highest factor loadings among all domains, further supporting its critical role in technology acceptance and educational effectiveness. The most important criteria for the acceptance of new tools in the health system include ease of use, usefulness, and usability. A systematic review and meta-analysis by Ahmed et al. (2023) on educational smartphone applications also indicated that systems with confirmed ease of use and usefulness achieved higher user acceptance (17). The results of the present study are in agreement with these findings. Notably, the CFA results in this study provide empirical support for these constructs within Rogers' framework, strengthening their relevance in the context of midwifery education.

It should be noted that after confirming the innovative aspects of the application, the next phase of the study, which involves comparing this innovative approach with traditional educational methods on screening tests among midwifery students, will be evaluated and published in a separate article.

One of the strengths of this study was the high participation rate. Furthermore, this study provided a validated tool for evaluating the first-time implemented smartphone-based educational project in Iran. One of the limitations of this study was that the system was designed only for Android platforms, which excluded students using iOS devices.

## CONCLUSION

Based on the results of the CFA and according to the goodness-of-fit indices, all five constructs of the Diffusion of Innovation theory were confirmed in the Smart Screening System (ISA). Therefore, this system possesses the required features of an innovation and has a high likelihood of successful, widespread use. However, it should be noted that based on the theory of diffusion of Innovation, the diffusion of an innovation may further be affected by other components, including communication

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**Ethical Considerations:**

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. This study was part of a Master's thesis in medical education, which was approved by the Ethics Committee of the Smart University of Tehran (Code: IR.SMUMS.REC.1402.033).

**Declaration**

In this article, ChatGPT-4 was employed to assess

grammar and enhance the textual content. Subsequently, the authors thoroughly examined and edited the content as required, assuming complete responsibility for its accuracy and quality.

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**Conflict of Interest:** The authors declare that they have no competing interests.

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