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DEVELOPING AN ODL TECHNOLOGICAL READINESS INSTRUMENT: A CONTENT VALIDITY APPROACHES

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Abstract

Open and distance learning (ODL) is an important educational model that provides flexible and accessible learning opportunities. Its effectiveness depends on the technological readiness of learners, i.e., the knowledge, skills, attitudes, and resources available to use digital tools. To achieve quality outcomes, the tools to accurately measure technological readiness must be available. The aim of this research is to develop and validate an instrument adapted from the Parasuraman Technology Readiness Index (TRI) to measure ODL's technology readiness, while documenting the development process, content and language expert feedback, and revisions to improve transparency and rigour. This mixed-methods psychometric research describes the process of instrument adaptation, which includes item selection and modification (by the researcher), item content review (by the expert), item redesign (by the researcher), and statistical item validation (using CVI scoring) tailored to the ODL context. Through iterative revisions guided by expert feedback, the instrument was refined to ensure its relevance, clarity and representation of intended constructs. The final version of the instrument has robust content validity (S-CVI=0.96, I-CVI/Ave=0.94 and S-CVI/UA=0.81) and captures dimensions of technology readiness (optimism, innovativeness, discomfort and insecurity) from the ODL perspective.

Keywords: ODL, Technological Readiness, Instrument, TRI, Content Validity

1 INTRODUCTION

In the realm of academia, educational tools hold significant significance in stimulating the desire for knowledge and enhancing the comprehension of researchers within their specific domains (OECD, 2016). The resources provided encompass a diverse range of materials, such as textbooks and computer programmes, with the explicit purpose of enhancing the depth and significance of topic inquiry. These resources facilitate a heightened sense of interest and intellectual vigour among individuals by offering supplementary knowledge, exercises, and real-life illustrations that extend beyond the conventional boundaries of the classroom. This empowerment enables individuals to engage more extensively with their selected academic fields.

Within the educational research, the utilisation of this idea serves the purpose of ascertaining the extent to which a given test or survey effectively captures the comprehensive spectrum of the desired subject matter, hence ensuring its reliability as a tool for investigating diverse themes or behaviours (Obilor & Miwari, 2022). Ensuring comprehensiveness and meaningfulness of educational assessments and evaluations is of utmost importance.

The concept of "technology readiness" pertains to the degree to which learners possess the necessary preparedness to effectively utilise technology in order to attain their educational objectives (Davis, 1989). In Open and Distance Learning (ODL), the concept incorporates various variables, including the ease of learners' access to and proficiency in utilising technology, their level of preparedness in utilising technological tools, their ability to work autonomously, and their level of motivation (Hung et al., 2010). The degree of technical preparedness significantly influences the effectiveness of ODL initiatives. Hence, it is crucial to evaluate the technical preparedness of learners prior to implementing ODL programmes.

Content validity plays a pivotal role within the realm of academic research instruments. The statement fundamentally pertains to the degree to which an assessment tool effectively encompasses all aspects of the subject matter, conceptual framework, or behaviour that it is intended to evaluate (Connell et al., 2018). When content validity is deemed to be robust, it indicates that the test possesses a thorough coverage of the subject matter and effectively fulfils the requirements of its intended consumers. In order to ascertain content validity, it is frequently advised to initiate the instrument creation process by conducting an expert review conducted by an individual with expertise in the subject matter (Boateng et al., 2018). This evaluation aids in evaluating the extent to which the information aligns with the specific topic or discipline under investigation.

The content validity method plays a crucial role in the creation and evaluation of technological ready instruments for ODL (Kampa, 2023). This methodology guarantees that the instrument thoroughly encompasses the pertinent aspects of technology readiness, therefore enhancing the reliability and efficacy of the measures. Through the application of rigorous analysis, which encompasses the assessment of relevance and representativeness, researchers are able to effectively evaluate the preparedness of users (i.e learners) in utilising technology within ODL settings. Therefore, it is imperative to integrate the content validity approach into technological ready instruments for ODL. This is crucial in order to acquire dependable and strong data,

which will subsequently facilitate the development and execution of effective ODL programmes.

1.1 Instrument in academic research

In educational inquiry, instruments assume a crucial role in the acquisition and examination of data (Ediyanto et al., 2022). One of the primary purposes of instruments within the context of academic research is to quantify and assess variables (Pentang, 2023). The variables under consideration encompass a spectrum of elements, ranging from elementary ideas like age or gender to intricate structures such as attitude or intelligence quotient. Instruments offer a systematic methodology for assessing these variables, hence ensuring uniformity among participants or research circumstances. In the context of a educational investigation exploring the correlation between technology readiness, scholars may employ a standardised survey instrument to evaluate the extent of participants' technology readiness. This approach facilitates the establishment of significant comparisons and enables further statistical analysis.

Furthermore, this instruments facilitates the process of data collecting by empowering the researcher to efficiently obtain information. Instruments, such as surveys, offer a systematic framework for eliciting responses from participants. This approach enhances the efficiency of the research process and guarantees the systematic and methodical collection of data (Canals, 2017). In order to align the instruments with their particular research objectives, researchers possess the ability to modify them by formulating inquiries or assignments that facilitate the acquisition of the intended data.

Instruments play a crucial role in academic research as they facilitate the measurement of variables, enhance the efficiency of data collection, and enable effective analysis of information (Taherdoost, 2021). Researchers can enhance the precision and calibre of their work, thereby making significant contributions to the progression of knowledge in their respective academic domains, through the use of suitable instruments. Hence, a comprehensive comprehension and proficient utilisation of instruments are imperative in facilitating the execution of efficient and dependable scholarly investigations.

1.2 Technology readiness in ODL setting

ODL is a cutting-edge method of teaching that makes use of technology to reach learners outside of the regular classroom (Haleem et al., 2022). Evaluation of ODL technology's suitability for successful application is crucial given the unheard-of speed at which technology

is developing. Infrastructure, accessibility, pedagogical strategies, and learner support systems are just a few of the components that make up ODL technology ready.

The ODL's infrastructure is crucial to its success. For accessing online learning resources, a dependable internet connection and hardware are a must (Mohd Basar et al., 2021). Technological advancements have dramatically enhanced global connectivity, making it simpler for learners to access ODL content. However, closing the digital divide is still difficult, particularly in isolated locations with poor infrastructure. To accommodate the various needs of learners, ODL technology's accessibility needs to be increased (Noh et al., 2021). This includes providing accommodations for learners who have learning differences, language difficulties, or low technical aptitude. Screen readers, subtitles, and multilingual interfaces are a few examples of inclusive features that ODL platforms should provide. Technology must be used into ODL pedagogical strategies to encourage participatory and interesting learning (Noh et al., 2021). The utilization of collaborative technologies, virtual simulations, and multimedia materials can boost learner enthusiasm and information retention. A successful learner support system is essential to ODL's success (Zuhairi et al., 2020). Dedicated support groups, online discussion boards, and chatbots can offer quick assistance and respond to learners' queries. Platforms for peer-to-peer cooperation and online communities can encourage social engagement and provide learners a sense of community. Infrastructure, accessibility, pedagogy, and learner support systems are all included in ODL technology readiness.

Effective ODL adoption requires innovative pedagogy, inclusive design, and extensive support systems. When these factors are considered, ODL technology may unleash the full potential of open and distance learning, empowering learners and increasing educational opportunities for everyone (Bordoloi, 2018).

1.3 Instrument to measure technology readiness in ODL setting

Technology readiness plays a crucial role in the success of ODL initiatives. There are some notable instruments that have been used to measure technology readiness in the ODL setting. Technology Readiness Index (TRI) (Parasuraman, 2000) was developed to measure individuals' readiness to embrace and use technology. TRI encompasses dimensions such as optimism, innovativeness, discomfort, and insecurity. By capturing learners' attitudes and beliefs, the TRI helps institutions gauge their readiness for technology-mediated learning.

Measuring technology readiness in ODL settings is vital to ensure learners' success and engagement. The TRI are examples of instruments that have been utilized to evaluate learners' preparedness. These instruments enable educational institutions to identify areas for improvement and design appropriate interventions to enhance learners' technology readiness.

Many studies have used TRI to measure learners' readiness for the e-learning process (Al-Fraihat et al., 2020; Bessadok, 2015; Blut & Wang, 2020). Researchers have made various decisions based on their findings. In the Malaysian context, studies tended to focus on full-time learners rather than adult learners specifically studying in ODL (Ab Rahman et al., 2022; Chung et al., 2020; Mugahed Al-Rahmi et al., 2018). In order to measure the readiness of adult learners to follow ODL learning effectively or not, the instruments of TRI should be prepared considering their situational factors, i.e. adult learners studying in the ODL system.

1.4 Research gaps

The current research landscape on technology readiness in ODL environments has revealed two gaps: first, the need to assess the validity of instruments measuring technology readiness in ODL environments, and second, the lack of research on the predictive validity of these instruments in the context of ODL environments.

1.5 Aim and research objectives

This research aims to develop and validate specific tools tailored to assess the level of technological readiness in the context of ODL. On this basis, the following research objectives were set. The first is to develop an instrument to assess technology readiness in the context of open and distance learning (ODL). This instrument will include dimensions such as technological readiness, familiarity with online learning platforms and comfort with digital tools. Second, the research will carefully validate this instrument to ensure its accuracy in measuring technological readiness in the ODL environment. This validation process will include comprehensive assessments, statistical analysis and comparisons with established measurements or benchmarks.

2 METHODOLOGY

This instrument was developed using quantitative-qualitative (mixed-method) psychometric procedures. After adapting the original items to the ODL context, the experts rated the items on a 4-point Likert scale. The experts' numerical rating data were used to calculate the content validity index to validate the developed instrument.

3 FINDING AND DISCUSSION

3.1 Preliminary analysis

The Technology Readiness Index (TRI) is an intricate and multifaceted scale meticulously designed to gauge individuals' inclination to embrace novel technologies. Comprised of 36 attributes meticulously curated to measure this multidimensional construct and its various components, the TRI is hailed as an invaluable tool in deciphering people's attitudes towards technological advancements.

Within the TRI lie four underlying dimensions, each illuminating a distinct facet of one's technological readiness. The first dimension, optimism, reflects a profound and sanguine perspective regarding technology, entailing a steadfast belief in its potential to confer augmented control, flexibility, and efficiency upon users. Those harbouring an optimistic disposition possess a hopeful outlook, eagerly anticipating the empowerment technology will bestow. The second dimension, innovativeness, serves as a window into the pioneering spirits of individuals, beckoning them towards the vanguard of technological exploration. Embodying thought leadership, these trailblazers steer the course of technological progress, fostering innovation and guiding others along the path of advancement.

Conversely, the discomfort dimension exposes the darker recesses of one's apprehensions towards technology. It unveils an uneasy sentiment, indicative of perceived impotence when faced with the complex web of technological intricacies. A sense of being overwhelmed engulfs these individuals, underscoring the need for support and guidance to navigate the labyrinth of innovation effectively. The fourth and final dimension, insecurity, illuminates the depths of doubt that pervade the minds of some individuals. A pervasive distrust of technology's efficacy and reliability perpetuates scepticism, casting a shadow on the prospect of seamless integration with novel tools and systems.

The TRI's significance extends beyond mere theoretical underpinnings; its empirical validation as a predictive instrument for the adoption of innovative technologies fortifies its utility in research and practical application. It has emerged as a go-to resource for researchers and businesses alike, unveiling profound insights into people's proclivities and attitudes towards the technological landscape.

In research endeavours, the TRI unfurls a tapestry of findings that unfailingly offer distinct strategies pertinent to the introduction and promotion of cutting-edge products or services. With

its comprehensive profiling of individuals' technological readiness, businesses can tailor their approaches, ensuring seamless assimilation and engendering widespread acceptance.

In the rapidly evolving realm of technology, the TRI's versatility and widespread acceptance have granted it a pivotal role in understanding the intricate web of human-tech interactions. Its adaptability is evident in various domains, ranging from consumer technology acceptance to enterprise-level adoption strategies.

To conclude, the Technology Readiness Index stands as a beacon of insight into the human psyche, illuminating attitudes, reservations, and anticipations surrounding technology. Through its multidimensional lenses, the TRI empowers researchers and businesses with unparalleled clarity, enabling them to navigate the labyrinth of innovation with deftness and precision. As technology continues its inexorable march, the TRI remains an indispensable compass, guiding us through the boundless realm of possibilities and perplexities that lay ahead.

3.2 Instrument adaptation

The instrument has been adapted to the original edition by keeping the original specification – all four dimensions. But these dimensions were adapted to a new perspective, the ODL. The empirical validation of the TRI as a predictor of technology adoption makes it a valuable resource for researchers. By understanding individual attitudes and perceptions towards technology using the TRI, tailored strategies can be developed to assess learners' readiness for ODL. The dimension of innovation is a general dimension. It has to do with how readily someone adopts new technologies and how much they enjoy using the latest goods and services. It shows a person's curiosity, their openness to try new things and their willingness to take risks when introducing new technologies. This dimension applies to all viewpoints, including business (originally TRI) and other viewpoints such as education. Therefore, no changes were made to the items in this dimension.

3.3 Instrument validation

Validation of an academic survey instrument is a rigorous process that ensures the quality and accuracy of data collected through surveys in academic research. It involves assessing the validity and reliability of the instrument, seeking expert opinion and making necessary revisions to improve the effectiveness of the instrument. In this research, the items of the instrument were checked by validation based on expert opinions. Then the particular items were changed or improved from the original editions.

(a) Content Expert

A content expert for a research survey instrument is a person who has specialised knowledge and expertise in a particular topic area. They are responsible for validation in the development and design of a research survey instrument. The involvement of a content expert in the adaptation of the research survey instrument is crucial to ensure the validity and effectiveness of the instrument. Their knowledge and oversight help researchers produce high-quality data that can lead to meaningful and accurate research findings. They review the survey instrument and provide feedback on its relevance, clarity and suitability for measuring the intended construct. Feedback from the content experts help the researchers to ensure that the items used focus on the ODL environment.

Table 1. Sample of Expert Feedbacks on Items based Content

Dimension	Expert feedbacks
Optimism	▪ *Computer systems best replaced as technology. By mentioning computer system, the limit is only to computer/laptop based OS. From my understanding of your research +prior research on this TRI, the word technology will cover a broader spectrum* ▪ *What do you mean by computer system? Will learner understand this question?*
Discomfort	▪ *What technology system is referring to "technology system"* ▪ *Suggest to replace this relevant to the "learning" category"*
Insecurity	▪ *To replace with another phrase. e.g. when dealing with learners in a university*

Following feedback from the expert, changes or modifications were made to the relevant items. Examples of new items can be found in the following table:

Table 2. Sample of Proposed New Item by Each Dimension

Dimension	Description	Original Item	Adapted Item
Optimism	Positive view of technology and its benefits	*Technology makes you more efficient in your occupation.*	*Technology makes me more efficient in learning.*
Discomfort	Apprehension and feeling overwhelmed by technology	*I do not consider it safe to do business online*	*I do not think it's safe to learn through an online learning*

Insecurity	Distrust and scepticism about technology	*The human touch is very important when doing business with a company*	*The human touch is essential in dealing with a university*

(b) Language Expert

A language expert for survey instruments is a person who has strong language skills and expertise in designing, reviewing and refining survey instruments used in research studies. The role of a language expert in this context includes several important tasks, such as (a) linguistic clarity and consistency, (b) translation and localisation: the language expert could oversee the translation process and ensure that the translated versions retain the original meaning and intention.

Table 3. Sample of Expert Feedbacks on Items based Language

Aspect	Expert feedbacks
Clarity	▪ *Avoid jargon or technical terms that could confuse participants.* ▪ *Consider simplifying the language on this point so that respondents understand it better.*
Ambiguity	▪ *Clarify the scope of this item to avoid ambiguity.*
Instruction	▪ *Give respondents clear instructions on how to choose their response/feedback option*
Complexity	▪ *Simplify complex language or concepts, especially if your audience is made up of non-experts.*
Consistency	▪ *Ensure that the language and format of items are consistent throughout the instrument.*

(c) Context Validity Index – CVI

Validity refers to the extent to which a survey instrument measures what it intends to measure. There are different types of validity, such as face validity and content validity. Face validity assesses whether the instrument appears to measure what it is intended to measure, while content validity assesses whether the instrument adequately covers all relevant aspects of the construct being measured.

The content validity index (CVI) is a widely used method in quantitative evaluation to measure the extent to which an instrument contains an appropriate sample of items for the construct being measured (Shi et al., 2012; Zamanzadeh et al., 2015). There are two types of CVI: Item-CVI (I-CVI) and Scale-level CVI (S-CVI) (Yusoff, 2019). The i-CVI expresses the proportion

of agreement on the relevance of each item that is between zero and one, and the s-CVI is defined as the proportion of items on a scale that are rated as relevant by the experts (Almanasreh et al., 2019; Zamanzadeh et al., 2015). A modified kappa statistic (K*) can be used to adjust the I-CVI for chance agreement (Shi et al., 2012). They recommend that a scale with excellent content validity should consist of I-CVIs of 0.78 or higher and S-CVI/UA and S-CVI/Ave of 0.8 and 0.9 or higher, respectively.

Based on the CVI coefficeint (shown Apendix 1), this research concludes that the I-CVI, the I-CVI/Ave and the S-CVI/UA meet the satisfactory level and thus the scale of the item instrument has reached a satisfactory level of content validity. This means that the proposed instrument is suitable to measure learners' technological readiness in this ODL environment.

3.4 Proposed The Instrument Development Flow-chart using Content Validity Approach

Step 1 – Literature Review: Conduct a thorough literature review to gain an understanding of the current TRI and its dimensions (optimism, innovativeness, discomfort, and insecurity). To gather knowledge and identify potential modifications or additions to the TRI, review earlier research, publications, and empirical studies on technology readiness and adoption. *Step 2* – Identify the target group and context: Define the target population for the adapted TRI and determine the context in which the instrument will be used. Consider whether the instrument will focus on specific sectors, age groups or cultural contexts to ensure relevance and applicability. *Step 3* – Item Translation and Adaptation: Generate potential items that capture the dimensions of technology readiness for the specific target population and context. Use the findings from the literature review and consider input from experts and stakeholders. *Step 4* – Expert Review: Conduct a review by experts in the field to assess the validity and clarity of the items. Experts can provide valuable feedback on the relevance and appropriateness of the items for the intended population. *Step 5* – Validation: Administer the adapted TRI to a larger sample of the target population to assess its validity. Conduct content validity analysis to confirm that the items align with the proposed dimensions. The process can be illustrated as Appendix 2.

4 CONCLUSION

In summary, developing an ODL Technological Readiness Tool using content validity approaches is a critical step in measuring and improving readiness for online learning. This approach ensures that the tool truly captures the ability of both educational institutions and

learners to navigate the ever-changing world of online education, ultimately enriching the experience for all involved. In future research, further psychometric testing and validation can be conducted with a larger and more diverse group of experts to improve the robustness and generalisability of the instrument's measurement properties.

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REFERENCES

Ab Rahman, A. H., A. Samad, N. S., Abdullah, A., Yasoa', M. R., Muhamad, S. F., Bahari, N., & Mohamad, S. R. (2022). E-Learning and Sustainability of Pondok Schools: A Case Study on Post-COVID-19 E-Learning Implementation among Students of Pondok Sungai Durian, Kelantan, Malaysia. *Sustainability*, *14*(18), 11385–10395. https://doi.org/10.3390/SU141811385

Al-Fraihat, D., Joy, M., Masa, ed, & Sinclair, J. (2020). Evaluating E-learning systems success: An empirical study. *Computers in Human Behavior*, *102*(1), 67–86. https://doi.org/10.1016/j.chb.2019.08.004

Almanasreh, E., Moles, R., & Chen, T. F. (2019, February 1). *Evaluation of methods used for estimating content validity*. Research in Social and Administrative Pharmacy; Elsevier. https://doi.org/10.1016/J.SAPHARM.2018.03.066

Bessadok, A. (2015). (PDF) Classification of Student's Belief based on their Technology Readiness for an E-learning System. *Conference: INASE 2015 Recent Advances on Education and Educational Technologies*, 1–10. https://www.researchgate.net/publication/281002809_Classification_of_Student's_Belief_based_on_their_Technology_Readiness_for_an_E-learning_System

Blut, M., & Wang, C. (2020). Technology readiness: a meta-analysis of conceptualizations of the construct and its impact on technology usage. *Journal of the Academy of Marketing Science*, *48*(4), 649–669. https://doi.org/10.1007/S11747-019-00680-8/TABLES/5

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer. *Frontiers in Public Health*, *6*, 366616. https://doi.org/10.3389/FPUBH.2018.00149/BIBTEX

Bordoloi, R. (2018). Transforming and empowering higher education through Open and Distance Learning in India. *Asian Association of Open Universities Journal*, *13*(1), 24–36. https://doi.org/10.1108/AAOUJ-11-2017-0037/FULL/PDF

Canals, L. (2017). Instruments for gathering data. *Qualitative Approaches to Research on Plurilingual Education*, *1*(1), 390–401. https://doi.org/10.14705/rpnet.2017.emmd2016.637

Chung, E., Subramaniam, G., & Dass, L. C. (2020). Online learning readiness among university students in Malaysia amidst Covid-19. *Asian Journal of University Education*, *16*(2), 45–58. https://doi.org/10.24191/AJUE.V16I2.10294

Connell, J., Carlton, J., Grundy, A., Taylor Buck, E., Keetharuth, A. D., Ricketts, T., Barkham, M., Robotham, D., Rose, D., & Brazier, J. (2018). The importance of content and face validity in instrument development: Lessons learnt from service users when developing the Recovering Quality of Life measure (ReQoL). *Quality of Life Research*, *27*(7), 1893–1902. https://doi.org/10.1007/S11136-018-1847-Y/TABLES/2

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

Ediyanto, E., Sunandar, A., Ramadhani, R. S., & Aqilah, T. S. (2022). Sustainable Instrument Development in Educational Research. *Discourse and Communication for Sustainable Education*, *13*(1), 37–47. https://doi.org/10.2478/dcse-2022-0004

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*, 275–285. https://doi.org/10.1016/J.SUSOC.2022.05.004

Hung, M. L., Chou, C., Chen, C. H., & Own, Z. Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers & Education*, *55*(3), 1080–1090. https://doi.org/10.1016/J.COMPEDU.2010.05.004

Kampa, R. K. (2023). Combining technology readiness and acceptance model for investigating the acceptance of m-learning in higher education in India. *Asian Association of Open Universities Journal*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/AAOUJ-10-2022-0149/FULL/PDF

Mohd Basar, Z., Mansor, A. N., Jamaludin, K. A., & Alias, B. S. (2021). The Effectiveness and Challenges of Online Learning for Secondary School Students-A Case Study. *Asian Journal of University Education (AJUE)*, *17*(3), 1–11. https://doi.org/10.24191/ajue.v17i3.14514

Mugahed Al-Rahmi, W., Alias, N., Othman, M. S., Alzahrani, A. I., Alfarraj, O., Ali Saged, A., & Abdul Rahman, N. S. (2018). Use of E-Learning by University Students in Malaysian Higher Educational Institutions: A Case in Universiti Teknologi Malaysia. *IEEE Access*, *6*, 14268–14276. https://doi.org/10.1109/ACCESS.2018.2802325

Noh, N. H. M., Raju, R., Eri, Z. D., & Ishak, S. N. H. (2021). Extending technology acceptance model (TAM) to measure the students' acceptance of using digital tools during open and distance learning (ODL). *IOP Conf. Series: Materials Science and Engineering*, 1–11. https://doi.org/10.1088/1757-899X/1176/1/012037

Obilor, E. I., & Miwari, G. U. (2022). Content Validity in Educational Assessment. *International Journal of Innovative Education Research*, *10*(2), 57–69. www.seahipaj.org

OECD. (2016). *Innovating Education and Educating for Innovation*. https://doi.org/10.1787/9789264265097-en

Parasuraman, A. (2000). Technology Readiness Index (TRI): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Journal of Service Research*, *2*(4), 307–320. https://doi.org/10.1177/109467050024001

Pentang, J. T. (2023, May 1). Quantitative Research Instrumentation for Educators. *Lecture Series on Research Process and Publication*. https://www.researchgate.net/publication/369119498_Quantitative_Research_Instrumentation_for_Educators

Shi, J., Mo, X., & Sun, Z. (2012, February). *Content validity index in scale development*. Journal of Central South University Medical Sciences; Zhong Nan Da Xue Xue Bao Yi Xue Ban. https://doi.org/10.3969/J.ISSN.1672-7347.2012.02.007

Taherdoost, H. (2021). Data Collection Methods and Tools for Research: A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects. *International Journal of Academic Research in Management (IJARM)*, *10*(1), 10–38. https://hal.science/hal-03741847

Yusoff, M. S. B. (2019). ABC of Content Validation and Content Validity Index Calculation. *Education in Medicine Journal*, *11*(2), 49–54. https://doi.org/10.21315/eimj2019.11.2.6

Zamanzadeh, V., Ghahramanian, A., Rassouli, M., Abbaszadeh, A., Alavi-Majd, H., & Nikanfar, A.-R. (2015). Design and Implementation Content Validity Study: Development of an instrument for measuring Patient-Centered Communication. *Journal of Caring Sciences*, *4*(2), 165–178. https://doi.org/10.15171/jcs.2015.017

Zuhairi, A., Karthikeyan, N., & Priyadarshana, S. T. (2020). Supporting students to succeed in open and distance learning in the Open University of Sri Lanka and Universitas Terbuka

Indonesia. *Asian Association of Open Universities Journal*, *15*(1), 13–35. https://doi.org/10.1108/AAOUJ-09-2019-0038/FULL/PDF

END

CVI Calculation Table

Instrument Item		Rating				Expert in Agreement (EiA)	I-CVI based on Item	Universal Agreement (UA)
		Expert 1	Expert 2	Expert 3	Expert 4			
		Rating Code Rating 1 or 2 → "0" & Rating 3 or 4 → "1"				Total Rating by All Expert	EiA / Number of Expert	"1" = 100% "0" ≠ 100%
1	B1(1) Optimism 1	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
2	B1(2) Optimism 2	4→1	4→1	4→1	4→1	1+1+1+1=4	3÷4=0.75	0
3	B1(3) Optimism 3	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
4	B1(4) Optimism 4	2→0	2→0	3→1	3→1	0+0+1+1=2	2÷4=0.5	0
5	B1(5) Optimism 5	4→1	3→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
6	B1(6) Optimism 6	4→1	3→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
7	B1(7) Optimism 7	4→1	4→1	4→1	4→1	0+1+1+1=3	3÷4=0.75	0
8	B2(1) Innovativeness 1	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
9	B2(2) Innovativeness 2	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
10	B2(3) Innovativeness 3	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
11	B2(4) Innovativeness 4	4→1	3→1	3→1	3→1	1+1+1+1=4	4÷4=1	1
12	B2(5) Innovativeness 5	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
13	B2(6) Innovativeness 6	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
14	B3(1) Discomfort 1	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
15	B3(2) Discomfort 2	2→0	4→1	4→1	2→0	1+1+1+1=4	4÷4=1	1
16	B3(3) Discomfort 3	4→1	3→1	3→1	4→1	1+1+1+1=3	4÷4=1	1
17	B3(4) Discomfort 4	2→0	4→1	4→1	3→1	1+0+1+1=3	3÷4=0.75	0
18	B3(5) Discomfort 5	4→1	4→1	4→1	4→1	1+1+1+0=3	3÷4=0.75	0
19	B3(6) Discomfort 6	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
20	B3(7) Discomfort 7	1→0	4→1	4→1	2→0	0+1+1+0=2	2÷4=0.5	0
21	B3(8) Discomfort 8	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
22	B3(9) Discomfort 9	4→1	4→1	4→1	4→1	1+1+0+1=3	4÷4=1	1
23	B4(1) Insecurity 1	4→1	4→1	4→1	4→1	0+1+1+1=3	4÷4=1	1

24	B4(2) Insecurity 2	4→1	4→1	3→1	4→1	1+1+1+1=4	4÷4=1	1
25	B4(3) Insecurity 3	4→1	4→1	4→1	4→1	1+0+0+1=2	4÷4=1	1
26	B4(4) Insecurity 4	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
27	B4(5) Insecurity 5	4→1	4→1	4→1	4→1	1+1+1+0=3	4÷4=1	1
28	B4(6) Insecurity 6	3→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
29	B4(7) Insecurity 7	4→1	4→1	4→1	4→1	1+0+1+1=3	4÷4=1	1
30	B4(8) Insecurity 8	3→1	4→1	4→1	4→1	0+1+1+1=3	4÷4=1	1
31	B4(9) Insecurity 9	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
32	B4(10) Insecurity 10	4→1	4→1	4→1	4→1	1+1+1+1=4	4÷4=1	1
Code "1" Accumulated		**28**	**31**	**32**	**31**		**Total I-CVI based on Item =30**	**Total UA =26**
Proportions Relevance		$\frac{28}{32}$=0.88	$\frac{31}{32}$=0.97	$\frac{32}{32}$=1.00	$\frac{31}{32}$=0.97		**I-CVI/Ave based on I-CVI** $\frac{30}{32}$**=0.94**	**S-CVI/UA** $\frac{26}{32}$**=0.81**
S-CVI based on Proportion Relevence		$\frac{0.88+0.97+1.00+0.97}{4}$**=0.96**						

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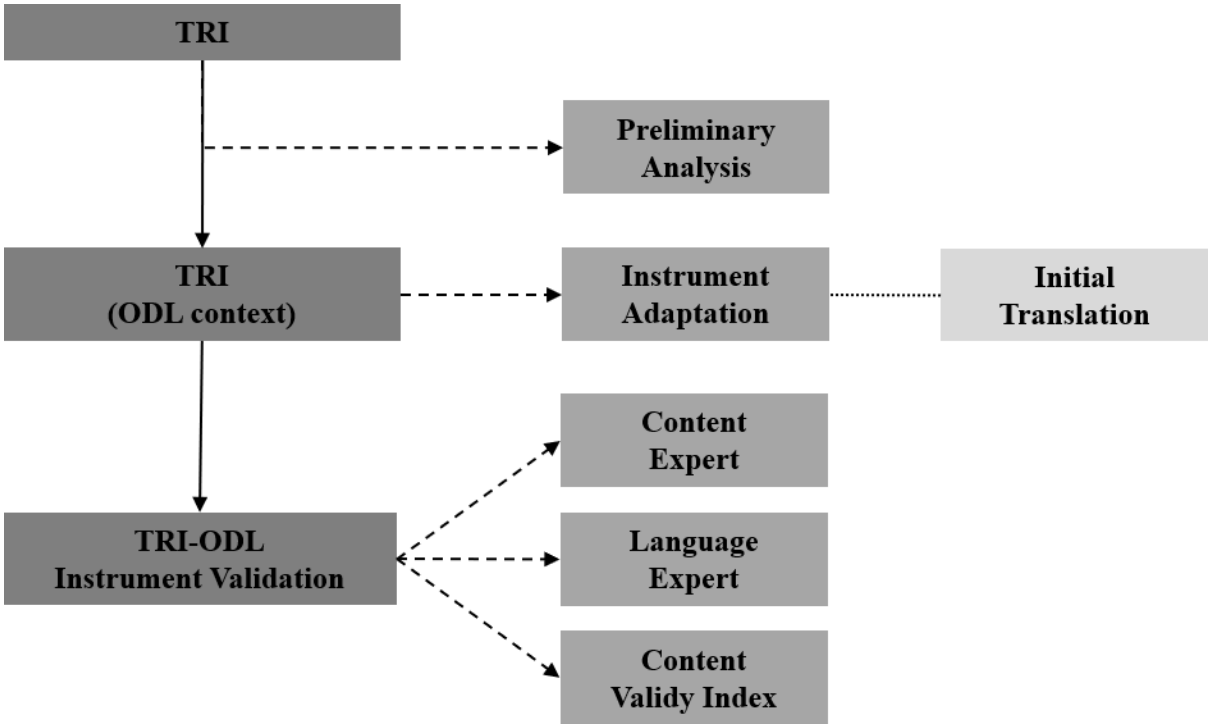
Appendix 2

Proposed TR-ODL Instrument Flow-chart



END