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Research Article

A needs assessment evaluation of information technology student mobile website design skills

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ABSTRACT

In this study, we present a comprehensive needs assessment (NA) aimed at identifying key factors that contribute to enhancing instructor skills in mobile website design (MWDS). In the realm of professional development, the significance of NAs for user experience (UX) designers has gained attention, with scholars emphasizing the importance of competency modeling to elucidate the intricate knowledge, skills, and abilities inherent in UX design. This perspective aligns with the essential nature of learning NAs for continuous professional development. Therefore, the objective of our investigation was to evaluate the current state of instructor MWDS and their real-world user experience through a sample of 41 individuals, including information technology (IT) instructors and IT entrepreneurs. Employing a simple random sampling method in August 2023, our study utilized descriptive statistics to analyze the data, revealing a moderate proficiency level (mean [M]=3.40). Interestingly, the highest rankings in our findings were attributed to planning mobile website design from a user experience perspective (M=3.81) and developing or creating a website for mobile devices user experience (M=3.81). These skills demonstrated consistent high perceived importance (M=4.78). Moreover, specific aspects of MWDS stood out in terms of significance, with developing or creating mobile websites' user experience holding the top priority (M=4.87), followed closely by designing mobile websites' user experience (M=4.79) and developing or prototyping mobile websites' user experience (M=4.77). Our findings underscore the urgent need to prioritize the promotion of MWDS, particularly those focused on user experience. Using priority needs index modified (PNImodified) method, we identified that user research holds the highest priority (PNImodified=0.56), followed closely by mobile website design user experience (PNImodified=0.41), and defining website content for mobile devices user experience (PNImodified=0.40). This information provides valuable insights for educational institutions and industry stakeholders, guiding efforts to enhance instructor skills and align curricula with the evolving demands of mobile web design. In summary, our study sheds light on the current state of instructor MWDS, emphasizing the importance of user experience-related competencies. The identified priority needs offer valuable guidance for educational institutions and industry stakeholders, facilitating efforts to enhance instructor skills and align curricula with the dynamic requirements of mobile web design. Notably, our results align with the hypothesis testing, where paired sample t-test statistics found that both overall and individual aspects indicated a statistically significant preference for desired over actual outcomes at the .01 level.

Keywords: mobile web design, needs assessment, priority needs index, Thailand, UX designer

INTRODUCTION

> "Design is not just what it looks like and feels like. Design is how it works" (Steve Jobs) (Ravazenghi, 2023).

Human learning is intricately shaped by the surrounding environment, with students adapting their learning styles based on individual methods, environments, and experiences (Bureekhampun et al., 2021). In the rapidly evolving landscape of information communication technology (ICT), the possibilities seem limitless. While artificial intelligence (AI) is poised to transform various professions, there remains a demand for distinctly human qualities in specific domains of ICT. At the forefront of this intersection are user experience (UX) designers (Hillmann, 2021).

UX designers play a crucial role as architects of exceptional digital experiences, aligning business strategies with user satisfaction (William & Hübscher, 2014). They transcend traditional boundaries, crafting designs that cater to user needs across software, product design, system development, and program creation. As such, businesses can transform their customer relations management systems into powerful tools for building customer loyalty and achieving sustainable business growth (Soliman, 2023).

The historical roots of user experience design can be traced back to Apple in 1993 when Don Norman, a cognitive psychologist and designer, coined the term (Brief History of UX Design, 2020). However, UX design would be difficult to image today without the inception of the world wide web (WWW). Credited to Sir Tim Berners-Lee, a scientist at CERN, WWW came into existence in 1990 (Reilly, 2021). This transformative era also saw the birth of the first website in 1990, serving as a guide to help users navigate and understand this groundbreaking technology. The introduction of the web browser 'Mosaic' in 1993 by Marc Andreessen and Eric Bina laid the foundation for future web browsers, with 'Netscape Navigator' emerging as a dominant force in the mid-1990s. Over 30 years later, the web has evolved into a technological marvel, firmly establishing itself as a platform for communication and commerce. Its proliferation across various devices, including smartphones, tablets, and televisions, has created unprecedented opportunities for individuals with web design skills.

The evolution of UX design from an information design model to a refined science of user-centric experience creation is evident (Pennington et al., 2016), with today's UX designers assuming unique positions. These include blending roles as art directors and web developers, guiding complex projects to enhance online sales, elevating user conversions, personalizing designs, and fostering user loyalty (Kimmel, 2015; Soliman, 2023). Furthermore, AI and machine learning have become integrated components of UX design across a wide spectrum of services and platforms (Abbas et al., 2022; Stige et al., 2023). These include ecommerce giants such as Amazon and social-media platforms such as YouTube.

In the contemporary job market, pursuing a UX designer education is becoming the norm, with a notable growth rate of 23.00% projected until 2031 for web developers, digital designers, and UX designers in the United States (Cooper, 2023). This dynamism has prompted companies, including tech giants like Google, Apple, IBM, and Bank of America, to prioritize skills over traditional qualifications (Asefer & Abidin, 2021; World Economic Forum, 2023). The focus is shifting from a college degree as a gatekeeper to specific job requirements and relevant experiences (Zhu & Zhang, 2023).

In this changing employment landscape, companies like Facebook exemplify the shift towards skill-centric hiring, emphasizing the importance of practical and applicable skills (World Economic Forum, 2023). LinkedIn's analysis of job postings in 2019 highlighted a clear trend: employers seek individuals with a blend of both hard and soft skills (Asefer & Abidin, 2021 Ganci & Lahey, 2017). These sought-after hard skills include cloud computing, AI, analytical reasoning, human resources management, and notably, user experience design (Hess, 2019).

Soft skills, such as creativity, persuasion, collaboration, adaptability, and time management, are equally valued in today's competitive job market (World Economic Forum, 2016). As pointed out by Hess (2019), these skills form the foundation upon which the future of employment is being shaped.

In the midst of technological advancement, the role of user experience designers becomes pivotal as they bridge the gap between technology and humanity, redefining the essence of design for the digital age (Yang

Figure 1. UX design in a 'user's journey' to become a new patient (Kaplan, 2023)

& Pu, 2020). Moreover, Thailand's Ministry of Higher Education, Science, Research, and Innovation (MHESI) has a clear mission to lay the foundation for the country's future and drive its path towards becoming a developed nation (Ussarn et al., 2022). This mission encompasses empowering individuals to become smart citizens, fostering knowledge creation and advancement, and embracing smart, connected products (Huang et al., 2023; Porter & Heppelmann, 2014; Slama et al., 2023). This visionary approach, articulated by Maesincee (2019), former Minister of MHESI of Thailand, underscores the Ministry's commitment to shaping a prosperous and equitable future for the nation.

In recent years, there has been much discussion about the Internet of things (IoT), which is expected to revolutionize products (Porter & Heppelmann, 2014). Smart, small, Internet-enabled devices give users unprecedented power to access the Web at anytime and anywhere. This interconnected web allows products with complex sensors to act as data storage devices, benefiting from ubiquitous wireless connectivity. The smartphone, in particular, has become a personal and public persona, giving users a voice that can be enhanced through a well-designed mobile user experience (Kaplan, 2023) (**Figure 1**).

In summary, the text explores the evolution of UX design, its relevance in the contemporary job market, and its pivotal role in bridging technology and humanity. Additionally, it discusses the mission of Thailand's Ministry of Higher Education and the transformative potential of smart, connected products in the era of IoT (Porter & Heppelmann, 2014).

How Critical is a Needs Assessment?

In the realm of professional development, the significance of needs assessments (NAs) for UX designers has gained attention. Borriraklert and Kiattisin (2021) stress the need for competency modelling to elucidate the intricate knowledge, skills, and abilities inherent in UX design. This view is echoed by Khang et al. (2023), who emphasize the pivotal role of competency models in articulating and evaluating performance within specific professions. Concurrently, Al-Ismail et al. (2023) highlight the essential nature of learning NAs for continuous professional development.

'NA' methodology, initiated by the United Nations Development Program (UNDP) in the 1990s, stands as a cornerstone in various research contexts (Chanyawudhiwan et al., 2023; Chimnoy et al., 2023; Choomsri & Chansirisira, 2023). Shea (1997) and Ul Haq (1995) underscore its systematic approach, facilitating the collection of robust data on social, economic, and environmental conditions. This method involves engaging with individuals to comprehend their unique circumstances, aspirations, and challenges.

In the Thai context, the concept of NAs has evolved into $PNI_{modified}$ (priority needs index [PNI]) formula (Wongwanich & Wiratchai, 2005). This method assesses and prioritizes development needs based on various indicators and criteria, with the 'modified' version tailored to suit Thailand's specific context and requirements (Wongwanich, 2015).

While UNDP's pioneering work laid the groundwork for targeted global development efforts, the refinement of this approach into formulas like $PNI_{modified}$ in Thailand underscores an ongoing commitment to understanding and addressing the unique needs of communities (Chainu et al., 2019; Pitiporntapin et al., 2023; Prasittichok & Klaykaew, 2022; Sittisak et al., 2022; Ussarn et al., 2022).

Numerous studies provide concrete examples of the utility of NAs. Sittisak et al. (2022) reported that NAs were instrumental in helping educators develop management skills and competency. Chanyawudhiwan et al. (2023) utilized $PNI_{modified}$ to rank the digital competencies of students in Thai open universities. Chimnoy et al. (2023) applied these tools to report on teacher management strategies in private elementary schools, while Choomsri and Chansirisira (2023) highlighted educator needs in developing smart schools, emphasizing that staff, management, media use, and supporting technology were key areas of concern.

Research Objectives

RO1

This research embarks on a NA to gauge individual perceptions of mobile website design skills (MWDS) (Brinck et al., 2001; Matthews et al., 2008). The study centers on staff instructors and student entrepreneurs within the Bachelor of Science program at King Mongkut's University of Technology, North Bangkok (KMUTNB) in Thailand.

RO2

Specifically, the study delves into the desired outcomes of MWDS, comparing these aspirations with the actual results in promoting MWDS for mobile devices, as viewed from the user experience. The research aims to prioritize the need to enhance MWDS based on user experience, contributing valuable insights to the broader discourse on UX design competencies.

Statement of Problem

Within the domain of information technology (IT) education, the proficiency of instructors in MWDS emerges as a critical factor for adequately preparing students to navigate the dynamic landscape of digital technologies. Despite the acknowledged importance of this proficiency, several challenges and gaps persist in our current understanding of instructor MWDS.

Firstly, there is a lack of comprehensive documentation regarding the real-world user experience proficiency of instructors in mobile website design, hindering our ability to gauge the effectiveness of current educational strategies. Additionally, while the importance of MWDS is recognized, there exists ambiguity regarding which specific skills within this domain hold the highest priority for effective instruction and real-world application.

Furthermore, a potential discrepancy between the perceived importance of instructor MWDS and their actual proficiency levels raises questions about the alignment of educational programs with industry demands. A systematic identification and prioritization of the needs associated with instructor MWDS are deemed essential for guiding educational institutions and industry stakeholders in optimizing training programs.

Moreover, recognizing the user experience as a central component of MWDS, there is a need to pinpoint specific aspects, such as user research and mobile website design user experience, that require focused attention. Finally, the translation of identified needs into actionable strategies for curriculum development and instructor training represents a critical step toward addressing the identified gaps.

In summary, this study seeks to contribute valuable insights into the challenges and gaps surrounding instructor MWDS. By elucidating these issues, it aims to inform the enhancement of instructor MWDS, aligning educational strategies with industry demands and fostering a more effective and user-centric approach to IT education.

METHODS

Research Design

The research design for the study was structured to assess the needs for promoting MWDS based on user experience within the context of IT majors enrolled in the Bachelor of Science program at KMUTNB, Thailand.

Table 1. Questionnaire reliability values overall & for each aspect

Aspects	Short name	Total items	Reliability
1. Planning mobile website design from a user experience perspective	SA1	5	0.89
2. User research	SA2	11	0.93
3. Customizing mobile website content user experience	SA3	4	0.82
4. Mobile website design user experience	SA4	12	0.92
5. Developing or creating a prototype website for mobile devices from a user experience perspective	SA5	3	0.81
6. Developing or creating websites for mobile devices with a user experience focus	SA6	3	0.83
Overview		38	0.98

Population & Sample

The population consisted of 20 IT instructors within the *Faculty of Industrial Technology and Management* at *KMUTNB* in Thailand and 66 IT entrepreneurs (86 total individuals). IT instructors were in the school's Department of Information Technology's Bachelor of Science program in the 2023 academic year. The population for IT entrepreneurs was the number of companies/organizations, where students performed cooperative education work/study in the 2023 academic year.

After the researchers had identified the population, simple random sampling was used to select 17 instructors and 24 IT entrepreneurs (41 total) to participate in the study. This research is quantitative and used PNI and paired sample t-test statistics. However, the researcher used a simple random sampling method to obtain the sample.

Research Tools

The research tool was a questionnaire on the need to promote MWDS based on user experience. Moreover, the survey focused on studying students' skills in Bachelor of Science program's IT major. Therefore, the researchers asked for the opinions of the IT curriculum instructors and IT entrepreneurs on providing feedback on students' skills and what they should be (NA). It was characterized by a scale of estimation, whose questionnaire was structured as a rating scale with five levels of assessment, with '1' = *most proficient* (4.50-5.00), '2' = *proficient* (3.50-4.49), '3' = *moderate proficiency* (2.50-3.49), '4' = *less proficient* (1.50-2.49), and '5' = *least proficient* (1.00-1.49).

Additionally, the survey evaluated six critical skills related to MWDS, emphasizing user experience (**Table 1**). The questionnaire comprised 38 items, each contributing to the comprehensive assessment of these skills. The reliability of the questionnaire, as measured by its reliability coefficient, ranged between 0.81 and 0.93.

Data Collection

The data collection process used questionnaires administered to 17 academic instructors and 24 IT entrepreneurs in August 2023. The data was gathered through an online platform using Google Forms.

Data Analysis

The data analysis focused on assessing the participants' opinions regarding the actual skills possessed by students and the skills that should be cultivated. This analysis was conducted using descriptive statistics, including frequency distribution, mean (M), and standard deviation (SD), with Google Sheets utilized for this purpose. Additionally, the analysis involved the application of the $PNI_{modified}$ method, as proposed by Wongwanich and Wiratchai (2005), using aspects suggested by Thailand's former MHESI Minister Maesincee (2019) in promoting MWDS based on user experience

Needs Assessment

As detailed in many studies over the past few decades, $PNI_{Modified}$ formula has been adopted to explore how an individual's needs change and how they are satisfied over an individual's lifetime (Wongwanich & Wiratchai, 2005). Operationally, the formula estimates individual aspects of their 'needs' by systematically determining gaps between the desired and current conditions (Chainu et al., 2019; Hongcharoen, 2020; Phetthong, 2022). For this study, 41 IT instructors and IT entrepreneurs were asked about their perception of the *intended or desired condition* (I), and the *actual condition* (D). The formula for calculating the outcome of

Table 2. General information of surveyed stakeholders (n=41)

Items	Number of participants	Percentage (%)
Position		
IT course instructors	17	41.46
IT entrepreneurs	24	58.54
Gender		
Men	28	68.29
Women	13	31.71
Age		
Under 30 years	4	9.76
Between 30-40 years	12	29.27
41 years & up	25	60.97
Education level		
Bachelor's degree	17	41.46
Postgraduate	24	58.54
Work experience		
Under five years	6	14.63
Between five-10 years	12	29.27
11 years & up	23	56.10

Table 3. Stakeholder opinions regarding actual & desired MWDS & user experience

Skill aspect (SA)	Actual condition			Desired condition		
	M	SD	Level	M	SD	Level
SA1. Planning mobile website design from a user experience perspective	3.81	0.84	P	4.75	0.44	MP
SA2. User research	3.06	0.97	MoP	4.76	0.43	MP
SA3. Customizing mobile website content user experience	3.38	0.85	MoP	4.73	0.45	MP
SA4. Mobile website design user experience	3.40	0.74	MoP	4.79	0.40	MP
SA5. Developing or creating a prototype website for mobile device user experience	3.54	0.77	P	4.77	0.42	MP
SA6. Developing or creating a website for mobile device user experience	3.81	0.77	P	4.87	0.34	MP
Average total	3.40	0.88	MoP	4.78	0.42	MP

Note. P: Proficient; MoP: Moderate proficiency; & MP: Most proficient; '1': Most proficient (4.50-5.00); '2': Proficient (3.50-4.49); '3': Moderate proficiency (2.50-3.49); '4': Less proficient (1.50-2.49); & '5': Least proficient (1.00-1.49)

this process was, as follows (Khamcharoen et al., 2022): $PNI_{Modified}$=(I-D)/D, where PNI is priority needs index, I is M for the *intended* or *desired* outcome, and D is M for the *actual* results or success.

Research hypothesis testing aimed to compare both overall and detailed aspects between *actual condition* (D) and *intended or desired condition* (I) using paired sample t-test at a statistical significance level of .01.

RESULTS

Stakeholder Information

Table 2 presents the general information of the surveyed stakeholders. From each participant's response, it was determined that 68.29% were male, while 41.46% were course instructors. Somewhat interestingly, 60.97% of the participants were 41 or older, while 58.54% had obtained a postgraduate degree. Given average age for such a large group, it is no surprise that 56.10% had worked in their career fields for 11 years or more.

Needs Analysis Results

Table 3 shows the needs analysis descriptive statistics analysis results, which included M, SD, and proficiency levels. **Table 3** shows that the overall results for MWDS based on user experience under actual conditions were moderate (M=3.40). When considering each aspect, it was found that the two aspects were equally ranked highest. These were SA1 (*planning the mobile website design from a user experience perspective)* (M=3.81) and SA6 (*developing or creating a website for mobile devices from the user experience)* (M=3.81). User research (SA2) had the lowest average (M=3.06).

On the other hand, as might be expected, desired conditions were significantly higher, with SA6 (developing or creating a website for mobile devices based on user experience) judged as the most desired condition (M=4.87). The desired condition means for the remaining five skill aspects (SA) were also at the highest level, with values from M=4.73 to M=4.79, with an overall average of M=4.78.

Table 4. Analysis & prioritization results & t-test for needs experience for MWDS

Skill aspect (SA)	Condition	Mean	Standard deviation	Index of essential needs		Hypothesis testing	
				(I-D)/D	Ranking	t	Significance
SA1	Desired (I)	4.75	0.34	0.25	6	11.01**	<.00
	Actual (D)	3.81	0.75				
SA2	Desired (I)	4.76	0.34	0.56	1	14.48**	<.00
	Actual (D)	3.06	0.82				
SA3	Desired (I)	4.73	0.38	0.40	3	11.62**	<.00
	Actual (D)	3.38	0.78				
SA4	Desired (I)	4.80	0.30	0.41	2	15.08**	<.00
	Actual (D)	3.42	0.59				
SA5	Desired (I)	4.77	0.38	0.35	4	13.13**	<.00
	Actual (D)	3.54	0.72				
SA6	Desired (I)	4.87	0.32	0.28	5	10.15**	<.00
	Actual (D)	3.81	0.75				
Total	Desired (I)	4.78	0.27	0.41	-	14.94**	<.00
	Actual (D)	3.51	0.63				

Note. **Significance<.01

Table 1. A table on top

Skill aspect (SA)	IT entrepreneurs (n=24)				t-test	IT instructors (n=17)				t-test
	Index of essential needs					Index of essential needs				
	Desired (I)	Actual (D)	PNI	Rank		Desired (I)	Actual (D)	PNI	Rank	
SA1	4.90	4.23	0.16	6	8.11**	4.54	3.24	0.40	*4*	10.65**
SA2	4.93	3.24	0.52	1	11.62**	4.53	2.81	0.61	1	8.56**
SA3	4.82	3.57	0.35	3	9.72**	4.59	3.12	0.47	2	6.93**
SA4	4.92	3.57	0.38	2	13.22**	4.62	3.15	0.47	*2*	8.32**
SA5	4.93	3.82	0.29	4	11.38**	4.55	3.14	0.45	3	8.04**
SA6	5.00	4.22	0.18	5	6.78**	4.69	3.24	0.45	3	9.78**
Total	4.92	3.63	0.35	-	12.18**	4.58	3.06	0.49	-	9.79**

Note. **Significance<.01

Needs Prioritization

Table 4 details the analysis results and prioritization of needs regarding MWDS user experiences. Results indicate that there is a need to promote MWDS user experience. The area with the highest $PNI_{modified}$ was SA2 (*user research*) (0.56), followed by SA4 (*mobile website design user experience*) (0.41), and third, SA3 (*customizing mobile website content user experience*) (0.40). In accordance with the results of the hypothesis testing using the paired sample t-test, it was observed that both overall and in specific aspects, the desired values were significantly higher than the Actual values at a statistical significance level of .01.

Needs Assessment Comparison & Priority Results

Table 5 details NA comparison and priority results between the two sample groups. First, SA2 (*user research*) was given the highest priority value by both sample sub-groups. Second was SA4 (*mobile website design user experience*). It, too, was judged at the same priority level by both sample sub-groups. Consistent with the results of the hypothesis testing using the paired sample t-test, it was found that both overall and in specific aspects, the Desired values were significantly higher than the Actual values at a statistical significance level of .01.

DISCUSSION

Several factors stood out from the study's NA research of MWDS promotion. These included the followings.

Need to Promote Mobile Website Design Skills User Experience

There is a need to promote MWDS user experience, with *user research* (SA2) receiving the highest $PNI_{modified}$ value (0.56). This was followed by *mobile website design user experience* (SA4) ($PNI_{modified}$=0.41), and third, *customizing mobile website content user experience* (SA3) (0.40).

These findings are consistent with Kuniavsky (2003), who reported that UR is a process of comprehending the impact on an audience of a specific design. Surveys, focus groups, and other forms of UR done before the design phase can determine whether a website is functional, usable, and successful. In today's market, user research is critical in ensuring people desire a product that fulfils their needs.

In research conducted on website design features that help in promoting emotional wellness and parenthood, the authors reported that the website needed to be credible (81.00%), effective (80.50%), personally relevant (86.80%), and easy to navigate (81.00%) (Da Costa et al., 2017). Similarly, UX designers in South Korea developed an mHealth platform consisting of a smartphone application synchronized with a wearable activity tracker and a web-based portal (Kim et al., 2022). From the study's NA, it was stated that end-user participation is essential in smartphone app development. Participants expected the smartphone app to include information on peripheral artery disease management (78.30%), exercise (75.40%), diet (60.10%), and health records (35.50%), with 85.00% of the patients willing to use a smartphone app.

Furthermore, UX research methods are excellent for generating user insights, motivations, needs, and behavior. Field methods commonly used are interviews, surveys, focus groups, diary studies, field studies (Baxter et al., 2015), and NAs. Other methods include card sorting and usability testing, which helps identify challenges.

Need to Promote User Research

As previously mentioned, the stakeholders judged *user research* (SA2) as having the highest $PNI_{modified}$ need (0.56). This is because students need to gain knowledge and skills in user research, which can be achieved through the use of '*curiosity*,' which has been stated as a fundamental component need in a designer's personality (Ravazenghi, 2023). Moreover, UX designers need to find the most efficient method in meeting user and business needs. However, "the best way" should be the most efficient one.

One method reported on by Zhu and Zhang (2023) was to make use of *collaborative learning* in teaching UX design in an online PBL environment. Xinghai (2023) in Malaysia emphasized the importance of *user research* in learning UX design. However, Fayez et al. (2023) reported that the best working educational model in teaching UX design should be centered around *human values* in addition to usability.

Similarly, Dirin et al. (2023) reported that the creation of emotionally engaging mobile applications requires knowledge of ever-changing technology, content richness, usability, and UX. With UX design a key element in long-term use. Interestingly, the authors also explored the concept of 'feelings of being' (existential feelings) in the context of mobile UX design.

Multiple authors have also noted the importance and designer need for awareness of 'feelings' or 'emotions' in user experiences for long-term use and engagement (Goldman et al., 2020; Lützhöft & Ghosh, 2020). This is consistent with Harley et al. (2017) who reported that long-term use requires emotionally engaged learners in m-learning.

Kuniavsky (2003) has added that user research also entails how you define user groups and which methods are used for collecting user data. Targeted user interviews and contextual inquiry are examples of this. Additionally, user surveys, focus group meetings, card sorting, website usability testing, creating profiles as real people (persona), creating user paths (user flow), and creating user journeys (user journeys) are effective methods.

According to Roschuni et al. (2013), user research drives design decisions, partly accomplished by understanding the end users. Additionally, the authors feel that communications are critical in user research. Pennington et al. (2016) discussed how libraries are moving towards UX and user-centered design ideas to increase user satisfaction. Finally, Simsek and Ates (2022) have added that the perceived ease of use and perceived usefulness in software contribute and influence each user's attitude, which make a significant impact of their use intention.

Empowering Smart Citizens

The promotion of MWDS, especially in user research and user experience, directly contributes to the objective of empowering smart citizens (Huang et al., 2023; Maesincee, 2019; Porter & Heppelmann, 2014; Slama et al., 2023). As technology becomes increasingly integrated into daily life, individuals equipped with

proficient mobile web design skills are better positioned to engage with digital platforms, contribute meaningfully to the digital landscape, and make informed decisions (Da Costa et al., 2017; Kim et al., 2022). In Thailand, Aranyanak and Charoenporn (2020) have reported that UX designers for Thai job apps for senior citizens need to focus on effectiveness, efficiency, and satisfaction.

Knowledge Creation & Advancement

The identified needs in MWDS align with the broader goals of knowledge creation and advancement. By emphasizing user research and user experience, the study recognizes the evolving nature of technology and the need for continuous learning and adaptation (Kuniavsky, 2003; Roschuni et al., 2013; Xinghai, 2023). This aligns with the overarching objective of fostering a thriving ecosystem for researchers and advancing knowledge across various disciplines.

Smart-Connected Products

In the realm of smart-connected products (e.g., IoT), the enhancement of mobile website UX design skills hold immense relevance. This technological revolution has been referred to by Porter and Heppelmann (2014) as the third wave, where IT is becoming an integral part of the product itself (Huang et al., 2023). Embedded sensors, processors, software, and connectivity in products, coupled with a product cloud, where data is stored and analyzed, are driving dramatic enhancements in product functionality and performance (Slama et al., 2023). User research and user experience are pivotal in designing products that seamlessly integrate into this new IoT. The study's findings, when applied to the design of smart-connected products, can lead to innovations that cater to user needs and preferences effectively.

Needs Assessment

The study itself is a manifestation of the broader concept of NA. By identifying and prioritizing specific needs in mobile web design skills, the research contributes to the ongoing dialogue on addressing societal and educational requirements. The identified needs serve as a benchmark for future NAs, guiding educational institutions and industry stakeholders in refining their strategies.

Creating a Cohesive Narrative

By weaving these interconnected themes together, the study paints a comprehensive picture of the multifaceted implications of the identified issue. The promotion of MWDS is not isolated but rather part of a larger narrative that encompasses the empowerment of individuals, the advancement of knowledge, the evolution of smart-connected products, and the ongoing process of NA.

In conclusion, this integrated perspective underscores the significance of addressing the identified needs in MWDS, positioning it as a critical component in the broader landscape of technology, education, and societal progress. The study serves as a catalyst for fostering smart citizens, advancing knowledge, shaping smart-connected products, and informing ongoing NA efforts (Al-Ismail et al., 2023; Borriraklert & Kiattisin, 2021; Chanyawudhiwan et al., 2023; Chimnoy et al., 2023; Choomsri & Chansirisira, 2023; Khang et al., 2023).

CONCLUSIONS

Results from an IT instructor and entrepreneurs' NA concerning how students viewed their MWDS and user experience determined that, first and foremost, *user research* experience was judged to have the highest desired and actual/current need. This was followed by *mobile website design user experience.*

Therefore, given the anticipated growth within the mobile website design sector, higher education, and vocational institutions should examine what resources are currently available and what is required to meet this sector's present and future needs.

In conclusion, this NA study has highlighted the critical importance of enhancing instructor MWDS, particularly in user experience. The findings from the research highlight a pressing need to focus on user research, mobile website design user experience, and customized mobile website content user experience as top priority areas for improvement.

$PNI_{modified}$ indicated that user research was the highest priority need ($PNI^{modified}$=0.56). This aligns with contemporary design principles, emphasizing the significance of understanding the impact of design on the audience. User research, through surveys, focus groups, and other field research, is instrumental in ensuring the functionality, usability, and overall success of mobile website designs. This user-centric approach is pivotal in delivering products that meet user needs and desires in today's competitive market.

Moreover, it is crucial to acknowledge that user research is a rich source of insights into user motivations, needs, and behaviors. Methods such as interviews, surveys, focus groups, diary studies, and field studies play an integral role in obtaining these insights. As per industry recommendations, qualitative research, often involving smaller sample sizes, is essential for understanding the intricate details of user experiences.

The study also emphasizes the importance of user journeys and flows as UX tools for understanding how individuals interact with services and products. Defining user groups and selecting appropriate data collection methods, including targeted interviews and contextual inquiries, are essential for effective user research. This corroborates findings from established experts, reinforcing the view that user research profoundly influences design decisions and ultimately leads to improved user satisfaction. In the ever-evolving landscape of mobile web design, enhancing user experience skills, guided by robust user research and aligned with user-centered design principles, is pivotal.

In conclusion, the findings presented in this study underscore the pressing need to prioritize user research and related MWDS. These skills are instrumental in ensuring the success and effectiveness of mobile websites in meeting user needs, and they must be integrated into educational programs and training to empower the next generation of IT professionals and UX designers.

Study Significance/Research Benefactors

The findings from this NA research on the promotion of MWDS detail several crucial factors that bear significance for educators, industry professionals, and educational institutions alike.

The identified needs in MWDS, particularly in user experience and user research, hold paramount significance in the rapidly evolving landscape of IT and user-centric design. As digital interfaces become more prevalent, the ability to craft mobile websites that offer an optimal user experience is essential for meeting the demands of the market.

For educational institutions, especially in higher education and vocational training, the study underscores the necessity to reassess and enhance resources dedicated to mobile website design education. The prioritization of skills such as user research, mobile website design user experience, and customized mobile website content user experience should guide curriculum development and instructional strategies.

IT instructors stand to gain immensely from the study's outcomes. Understanding the specific needs and priorities, especially in user research, can inform instructional approaches and enable instructors to tailor their teachings to better prepare students for the evolving demands of the industry.

The study's findings offer direct relevance to IT entrepreneurs and professionals in the mobile web design sector. Awareness of the identified needs, particularly in user research and user experience design, provides valuable insights for businesses aiming to stay competitive by aligning their practices with industry standards and user expectations.

While the study focused on a specific region, its implications extend globally. The identified needs and priorities in MWDS are reflective of broader trends in the IT industry. Therefore, the study serves as a catalyst for similar assessments in diverse cultural and linguistic contexts.

In conclusion, this research on MWDS NA not only addresses immediate concerns within the local context but also contributes to the broader discourse on IT education and industry practices. The study's outcomes have tangible benefits for educators, IT professionals, and the industry at large, offering valuable insights that can shape the future direction of mobile website design education and practice.

Limitations

While this study has provided valuable insights into NA of instructor MWDS, several limitations should be acknowledged, which highlight areas for future research and improvement:

1. **Sampling size and demographics:** The sample size in this study was relatively small, comprising 41 IT instructors and IT entrepreneurs from a specific region. This limited sample size may impact the findings in a broader population of IT professionals. Furthermore, the study's focus on Thailand may only partially represent IT professionals' diverse perspectives and needs worldwide.
2. **Research methodology:** The study utilized a cross-sectional design, offering a snapshot of participants' needs and perceptions in August 2023. However, a longitudinal approach may provide different insights into understanding how these needs evolve.
3. **Data collection method:** Self-report data were predominantly used in this study, potentially introducing response and social desirability biases. Participants' responses may only partially reflect their actual skills and needs.
4. **Limited scope of analysis:** The study focused on assessing MWDS from a user experience perspective. Other factors influencing instructor skills, such as the role of educational institutions, available resources, or changes in industry standards, were left for future studies.
5. **$PNI_{modified}$ method:** While $PNI_{modified}$ method is valuable for assessing needs, it relies on subjective assessments and may be susceptible to individual biases. The criteria for prioritizing needs vary depending on the context and may be somewhat arbitrary.
6. **Language and cultural bias:** This study was conducted within a particular cultural and linguistic context, which may influence the perception of mobile website design needs. Cultural and language differences in the understanding and prioritization of skills could impact the generalizability of the findings to other regions.
7. **Time constraints:** The study operated within a limited timeframe, which may have affected the depth and breadth of data collection. Extended research periods could offer a more comprehensive understanding of long-term needs and trends.

Acknowledging these limitations is essential for comprehensively understanding the study's scope and applicability. It provides a foundation for further research and improvement in the critical area of instructor MWDS assessment.

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Declaration of interest: The authors declare no competing interest.

Data availability: Data generated or analyzed during this study are available from the authors on request.

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