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Examining Students' Readiness for MOOCs: Applying a Structural Equation Modeling Approach

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Abstract

This study investigates students' readiness to adopt Massive Open Online Courses (MOOCs) at the University of Ha'il. It applied Student Online Learning Readiness (SOLR) model to examine the constructs that might influence students' readiness toward using MOOCs. A questionnaire was sent to students that measured the model's latent constructs: technical competency (TC), social competency (SC), communication competency (CC), and student readiness. A total of 111 responses were received, and the model was analyzed relied on structural equation modeling (SEM). The findings showed that TC and CC had a significant positive effect on the readiness of students to use MOOCs. Surprisingly, SC had an insignificant effect on students' readiness. The findings of this study provide educational decision-makers and designers with essential input for delivering effective MOOCs.

Introduction

The MOOCs have several definitions in the literature because of their ongoing historical development as open access and widespread use. MOOCs are defined by The European Association of Distance Teaching Universities as designed online courses for many participants, which are available anywhere where users have an internet connection, are free to everyone without specific qualifications, and offer a comprehensive experience through online courses (Jansen & Schuwer, 2015). Sokolik (2014), on the other hand, defines MOOCs as massive (large enrollment), open (not depending on users; location and free), online (fully digital), course (not only saved digital materials but a structured curriculum linked with instructors' guidance and schedule). MOOCs are built based on connectivism, a theory of learning from the digital age, established by Downes and Siemens, who firstly created MOOCs (Sokolik, 2014).

Many factors encourage students to enroll in MOOCs. Students prefer to enroll in MOOCs for several reasons, including professional materials development, intellectual challenge, and curiosity (Skrypnyk et al., 2015; Milligan et al., 2016). MOOCs offer substantial benefits for education, such as supporting the visibility of educational institutions by helping them to receive a new community and students (Porter & Beale, 2015), involving academics in creating online courses (Jenner & Strawbridge, 2015), and enhancing program quality by supporting course developers (Pscheida et al., 2015). MOOCs provide the opportunity to invest and create new online platforms to support educational activities (Roland et al., 2015).

The enormous benefits of MOOCs can challenge the existing educational institutes, as stated in *Business Innovation and Skills Department* in the UK (Haggard et al., 2013). However, some studies said that only a small number of students actually complete online courses (Lee & Choi, 2011; Seaton et al., 2015). The MOOCs' design can leave students feeling lonely, isolated, and disconnected (Kilgore & Lowenthal, 2015). The requirement of being responsible for students during their learning is much higher in MOOCs. The importance of supporting the successful online learning experience is explained by Zawacki-Richter (2004), who said that the level of student support varies from one to another. Students' enriched interaction with academics and each other enhances the sense of belonging and reduces isolation (Tinto, 1998). Some factors may determine successful online learning, such as accessibility to computer learning (Selim, 2007). The use of MOOCs requires technical competency (TC), communication competency (CC), and social competency (SC) to ensure a valuable experience (Roca et al., 2018).

The concerns outlined above led to examining the students' readiness to use MOOCs (Sa'don et al., 2017; Al-Adwan & Khdour, 2020). The assessment of students' readiness to embark on an online course is essential and suggested by King and Alperstein (2015). Readiness is defined by James and Christian (2016) as the behavior and skills that the students need to be successful during their learning; the lack of readiness may negatively impact students' learning process. Being ready to learn in the MOOCs context is also needed because teachers and students are separated by distance, space, and time (James & Christian, 2016). This study aimed to assess students' readiness to use MOOCs at the University of Ha'il by examining TC, SC, and CC.

Literature Review

MOOCs readiness is essential as it requires measuring various competencies which enable students to complete courses. Competency is defined as skills, knowledge, or attitudes that enable users to perform the necessary activities effectively (IBSTPI, 2000). Kerka (1998) states that competence is based on individuals, emphasizing the outcomes, such as "what users know and what they can do," and providing flexible ways to achieve these outcomes. This study focused on the three essential competencies (SC, TC, and CC) for measuring students' readiness for MOOCs. Student Online Learning Readiness (SOLR), developed by Yu and Richardson (2015), includes these three competencies essential for measuring students' readiness. TC is the skills or knowledge required to perform a task (Vathanopas & Thai-ngam, 2007). On the other hand, CC is the ability to deliver information through a written or oral format (McCroskey & McCroskey, 1988). SC is managing and initiating positive social relationships, interaction, collaborating with others, and dealing effectively in the social environment (Rutherford et al., 1998).

The increased enrollment in MOOCs globally has encouraged researchers to focus on the critical role of assessing users' readiness for engaging them in courses (Gameel & Wilkins, 2019). Some studies have investigated the learners' readiness to adopt MOOCs (Zhou, 2016; Subramaniam et al., 2019). However, these studies focused on MOOC adoption in developed countries, while studies to address students' readiness to MOOCs are insufficient in developing countries. For example, in Saudi Arabia, MOOCs are considered in their infancy. Because most previous studies focused on investigating e-learning (Salloum et al., 2019; Sukendro et

al., 2020) and m-learning (Senaratne et al., 2019; Al-Adwan et al., 2018; Alshammari, 2021), very little information is known regarding students' readiness toward using MOOCs in Saudi Arabia. Incorporating MOOCs in higher education could provide an essential strategy for enhancing learning and teaching quality in Saudi Arabia.

Furthermore, MOOCs can be used as a new way to deliver education to increase the positive competition among learning and teaching and offer valuable opportunities in global online courses. To date, very few studies have been explored MOOCs readiness in Saudi Arabia (Alhazzani, 2020). This study aimed to assess students' readiness for MOOCs at the University of Ha'il. It focused on the effect of the three competencies: SC, TC, and CC. This study could be very beneficial for institutes in Saudi higher education to identify the primary factors affecting student readiness and develop strategies for addressing student needs for adopting and using MOOCs.

Theoretical Framework

The theoretical framework of this study is built based on the SOLR model, established by Yu and Richardson (2015). The SOLR model was based on the Tinto model (1998), the Student Integration Model (SIM). The framework for this study's research model is shown in Figure 1.

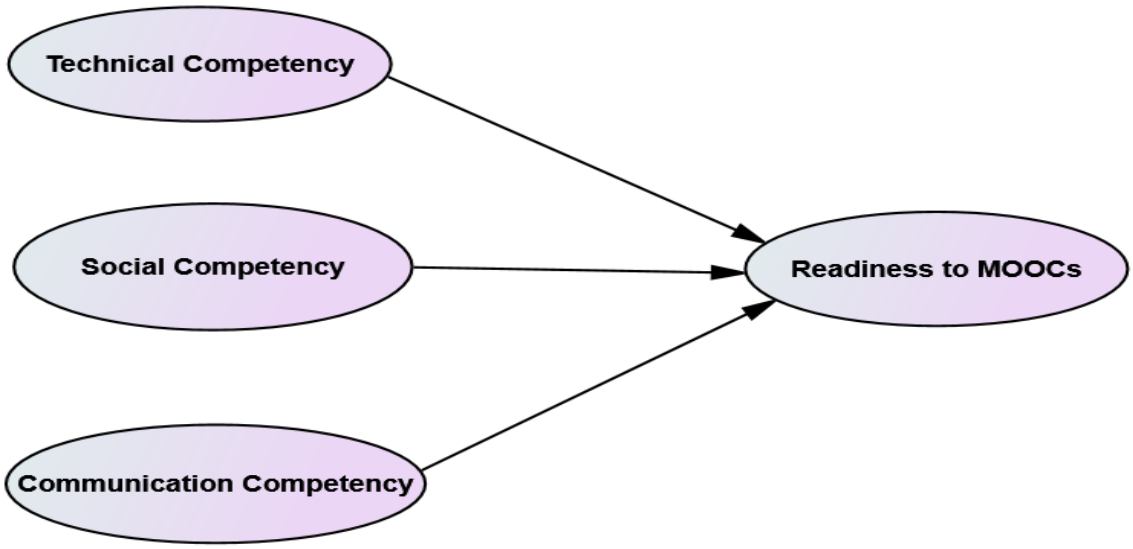

Figure 1. Research Model

According to Tinto (1998), academic and social integration are considered the most critical factors for student retention in their online courses. Academic integration is achieved once students enhance their academic performance and intellectual development. In contrast, social integration is achieved once students have positive relationships with their classmates and academics. Thus, students with a higher level of academic and social integration are most likely to be more committed to decisive goals, reducing the chance of dropping their courses. This shows the vital role of SC, significant in influencing the interaction of classmates and academics. Moreover, as stated in the SOLR framework model, CC enhances the interaction of students with their

academics. Furthermore, TC is also a significant factor influencing student retention in their online courses. Thus, the SOLR model's TC, SC, and CC are also convenient and applicable to student readiness for MOOCs.

Research Hypotheses

- H1: TC has a significant positive effect on students' MOOC readiness.
- H2: SC has a significant positive effect on students' MOOC readiness.
- H3: CC has a significant positive effect on students' MOOC readiness.

Methodology

Procedure and Sample

This study focused on higher education in Saudi Arabia, specifically the University of Ha'il, where students are enrolled in education, science, arts and literature, and the preparatory year. The questionnaires were administered using Google Forms during the four months from October 2021 to January 2022 (see Appendix for the questionnaires). The Convenience sampling technique was used. Of the 185 responses received, only 111 were suitable for use. Those not used were incomplete or unanswered.

Measures

The questionnaires consisted of two sections:

- Section A contained self-designed questionnaires that collected demographic information from respondents on sex, education level, major, college, devices used, and if they had been previously enrolled in MOOCs.
- Section B contained 22 items to measure all constructs in the proposed research model adapted and modified from previous studies.

The items measuring the TC, SC, and CC were adapted from a study by Yu & Richardson (2015), while the questions measuring the students' readiness for MOOCs were adapted from Mercado (2008). Responses to questions were on a scale ranging from 5 (strongly agree) to 1 (strongly disagree). The questionnaires are attached in the Appendix.

Statistical Analyses

The IBM Statistical Package for the Social Sciences (SPSS) analyzed the descriptive information or responses, while the SEM software IBM SPSS Amos 23.0 was used for the confirmatory factor analysis (CFA) testing the convergent, construct, and discriminant validity. SEM was used to test the hypotheses and analyze the relationships among all constructs in the research model. SEM is a comprehensive statistical analysis technique used to test the relationships among latent and observed constructs (Hoyle, 1995; Ullman & Bentler, 2012; Hair et al., 2013).

Results

Analysis of Demographic Information

Table 1 shows the respondents' information of participants. A total of 111 students (49.5% male and 50.5% female) responded to the questionnaires. Regarding education level, 42 students (37.8%) were enrolled in bachelor's degree programs, while 96 (62.2) were enrolled in master's degree programs.

Table 1. Respondents' Information

Characteristics	N	%
Sex		
Male	55	49.5
Female	56	50.5
Education_Level		
Bachelor	42	37.8
Master	69	62.2
Major		
Educational Technology	43	38.7
Sports Science and Physical Activity	21	18.9
Educational Leadership	12	10.8
Primary classes	4	3.6
Social service	5	4.5
Arabic	4	3.6
Curriculum	14	12.6
psychology	5	4.5
Biology	3	2.7
College		
Education	101	91.0
Preparatory Year	2	1.8
Science	3	2.7
Arts and literature	5	4.5
Device_USed		
Laptop	40	36.0
PC	31	27.9
Smartphone	30	27.0
Tablet device	10	9.0
Enrolled_in_MOOCs		
Yes	52	46.8
No	59	53.2

Most students were enrolled in educational technology (n = 43, 38.7%), followed by students who in sports science and physical activity (n = 21, 18.9%), and students enrolled in educational leadership (n = 12, 10.8%). The remaining students were enrolled in various majors such as social service, Arabic, curriculum, and biology. Most students were enrolled in the College of Education (n =101, 91.0%), while some were enrolled in other colleges such as Arts and Literature, Science, and Preparatory Year. In terms of the devices used, most students used laptops (n = 40, 36.0%), followed by personal computer (31, 27.9%), while a few used tablets (n = 10; 9.0%). Most students had not yet enrolled in MOOCs (n = 59, 53.2%), while the others tried some courses using MOOCs (n = 52, 46.8%).

Confirmatory Factor Analysis (CFA)

The pooled-CFA was conducted to assess the construct, discriminant, and convergent validity. Based on studies by Hair et al. (2010) and Awang (2015), the CFA is essential for validating the measurement model and assessing the construct correlation before proceeding to the SEM. The first run for pooled-CFA showed that some factors have low loading, and the model does not fit the data. Thus, further model modification is needed to meet the values suggested in the literature. Figure 2 shows the first pooled-CFA. The first result for the pooled-CFA showed that some values such as TLI and CFI had not met the required values, meaning that the model did not fit the data. Thus, some modifications were needed (see Table 2).

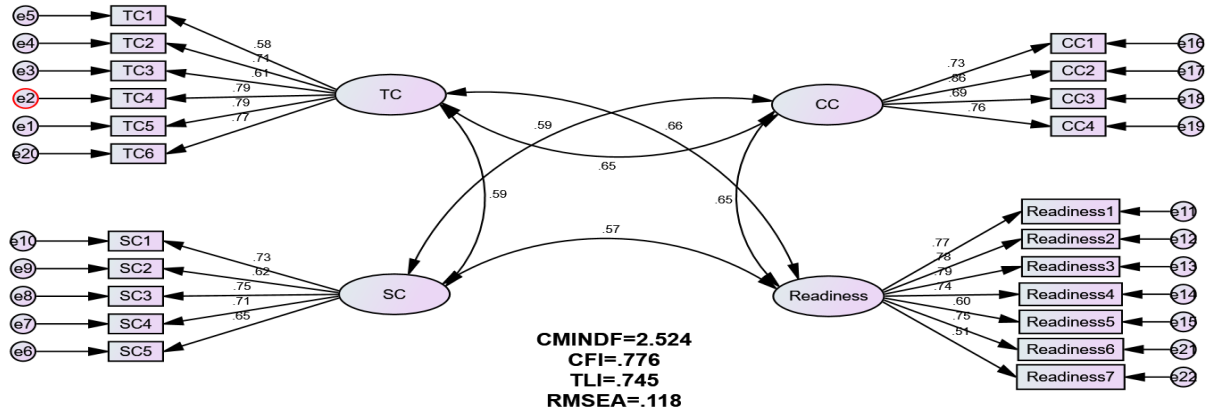

Figure 2 . The First Run of the Pooled-CFA

Table 2. Model Fit

Category	Index name	Index value	Accepted value	Results
Absolute fit	RMSEA	0.11	<0.10 (MacCallum et al, 1996)	not accepted
Incremental fit	TLI	0.74	>0.80 (Hair et al. 2010)	not accepted
	CFI	0.77	>0.80 (Halim et al, 2018)	not accepted
Parsimonious fit	Chi sq/df	2.524	<3.0 (Awang, 2015)	accepted

Some modifications to the model were made before conducting the second run. Some items with a low factor loading, such as Readiness7 and TC1, were eliminated. Other items such as SC5, TC5, and Readiness5 were eliminated due to a high standardized residual covariance above 0.4. Then, the second run for pooled-CFA was conducted, as shown in Figure 3. The results of the second run showed an improved model fit with all indices meeting the values suggested by the literature. As a result, construct validity was achieved (Awang, 2015). Table 3 shows the second run results.

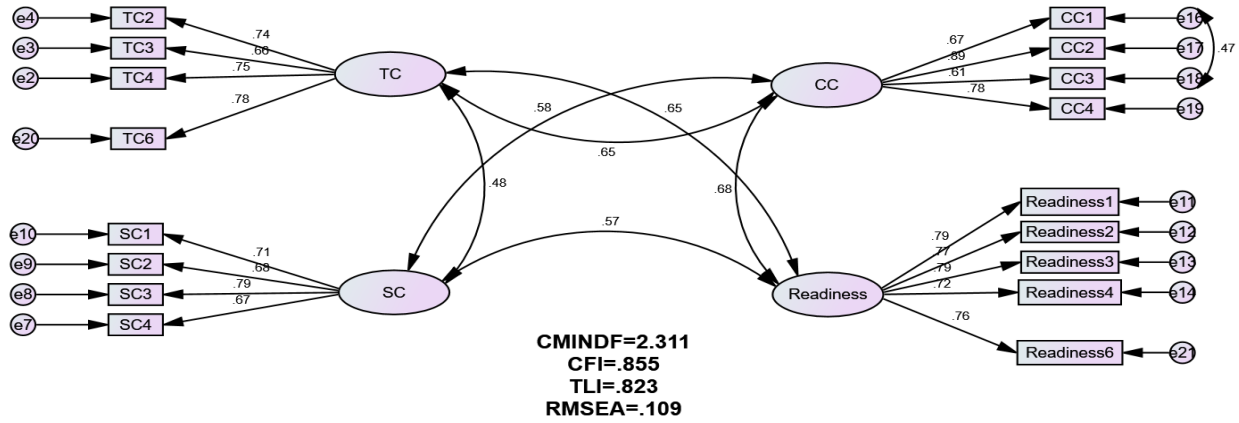

Figure 3. The Second Run of the Pooled-CFA

Table 3. Improved Model Fit

Category	Index name	Index value	Accepted value	Results
Absolute fit	RMSEA	0.10	<0.10 (MacCallum et al, 1996)	accepted
Incremental fit	TLI	0.82	>0.80 (Hair et al. 2010)	accepted
	CFI	0.85	>0.80 (Halim et al, 2018)	accepted
Parsimonious fit	Chi sq/df	2.31	<3.0 (Awang, 2015)	accepted

Convergent validity should be assessed by examining composite reliability (CR) and average variance extracted (AVE). When CR is above 0.6 and AVE is above 0.5, convergent validity is achieved (Hair et al., 2010; Awang, 2015). The CR and AVE results in Table 4 confirm that convergent validity was achieved.

Table 4. CR and AVE Values

	CR	AVE
CC	0.832	0.559
TC	0.826	0.543
SC	0.806	0.511
Readiness	0.875	0.585

The discriminant validity should be checked to confirm that each construct in the model is discriminant from the other. In Table 5, the values in bold are the square root of the AVE of the construct. The other values show the correlations among constructs in the model. The discriminant values are met once the value in bold is greater than all other values in its rows and column (Awang, 2015).

Table 5. Summary of the Discriminant Validity of the Constructs

	CC	TC	SC	Readiness
CC	**0.748**			
TC	0.654	**0.737**		
SC	0.582	0.475	**0.715**	
Readiness	0.680	0.655	0.566	**0.765**

Unstandardized Estimate

The unstandardized and standardized estimates are the two outputs of SEM. The unstandardized estimate is used for assessing the critical ratio value. The unstandardized estimate model and its values are shown in Figure 4.

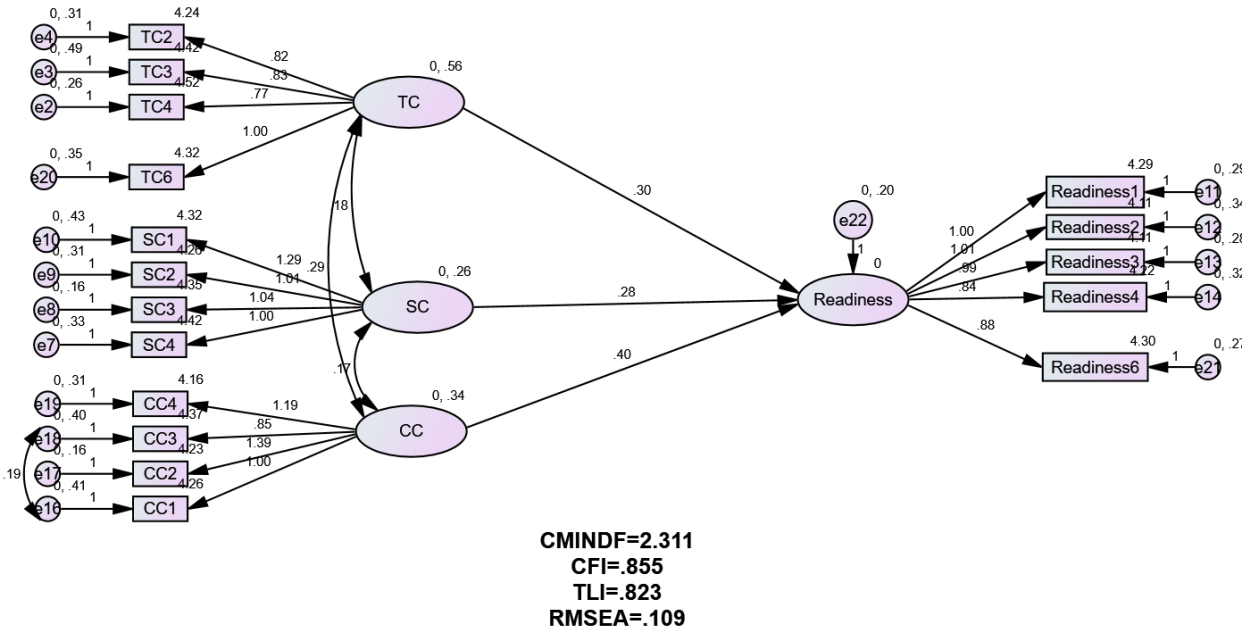

Figure 4. Unstandardized Estimate

Standardized Estimate

The standardized estimate is applied to assess the strength of relationships among constructs in the model by comparing the beta coefficient values and obtaining the value of R2 and factor loading. The R2 of the dependent construct, the student's readiness for MOOCs, was 0.57. It indicates that the exogenous constructs, TC, SC, and CC, explain the endogenous construct, the student's readiness for MOOCs, was 57%. This means that the still percentage, which is 43% remain unknown. In other words, some other factors could also contribute to the remaining percentage of MOOCs readiness in the model. Figure 5 shows the standardized estimate.

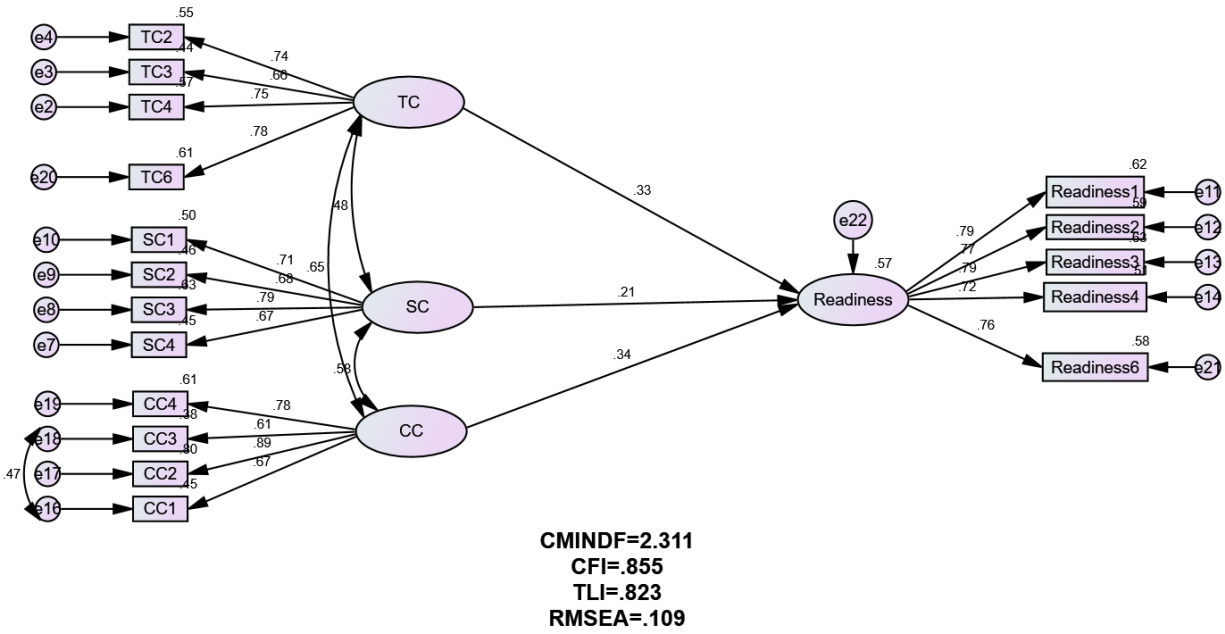

Figure 5. Standardized Estimate

Hypotheses Testing Results

The results of regression weight showed that TC and CC had a significant positive effect on students' readiness toward using MOOCs ($\beta = 0.304$, $p < 0.05$; $\beta = 0.403$, $p < 0.05$). Hence, H1 and H3 are supported. The results also showed that SC had an insignificant effect on students' MOOC readiness ($\beta = 0.282$, $p > 0.05$). Thus, H2 is not supported. Table 6 shows the results for the hypotheses.

Table 6. Regression Weights

			Estimate	SE	CR	P	Results
Readiness	<---	TC	.304	.117	2.610	.009	Significant
Readiness	<---	SC	.282	.155	1.824	.068	Insignificant
Readiness	<---	CC	.403	.166	2.430	.015	Significant

Discussion

The findings of this study show that TC and CC had a positive effect on students' readiness for MOOCs. In contrast, surprisingly, social competency did not affect students' readiness for MOOCs. TC had a positive impact on students' readiness for MOOCs, consistent with the findings of Al-Adwan & Khdour (2020) but inconsistent with Subramaniam et al. (2019), who found that TC has an insignificant effect on Malaysian students' readiness for MOOCs. These contrary results may be due to the different contexts in which studies were conducted. In this study, TC had a significant positive effect on students' readiness for MOOCs. Thus, MOOCs facilitators must consider that students' technical skills must be improved and further developed.

Furthermore, MOOCs developers and facilitators should recognize the vital role of students' technical and learning skills. The higher the level of student TC, the more successful students' readiness for MOOCs.

Surprisingly, the findings show that SC has an insignificant effect on students' MOOC readiness. This finding is consistent with Subramaniam et al. (2019) but contrasts the findings of Al-Adwan & Khdour (2020), who found that SC has a significant positive effect on students' readiness for MOOCs. The explanation for this result may be that when students engage in MOOCs, they do not aim at building social relationships with others to be ready. Instead, they consider technical and communication skills essential for MOOC readiness.

Furthermore, CC was found to have a significant positive effect on students' readiness for MOOCs. This finding is consistent with Willis (2013) and Al-Adwan & Khdour (2020). CC is fundamental for successful engagement in the MOOCs environment. Staubitz et al. (2015) found that the shortage of communication skills among students is a primary concern that may result in ineffective collaboration experiences. This means that online interactions are different from face-to-face communication, requiring a different competency, namely online CC. In addition, MOOCs developers and facilitators must consider the synchronous communication that encourages communication between students and their teachers. The higher the students' communication skills, the more readiness for MOOCs.

Conclusions

Students in higher education should have specific competencies for MOOCs. To achieve this purpose, the SOLR model was adopted to assess students' MOOC readiness among students at the University of Ha'il. The research model examined the effect of three competencies, TC, SC, and CC. This study showed that TC and CC had a significant positive effect on students' MOOC readiness; surprisingly, SC had little impact on students' MOOC readiness.

This study had several limitations. Although there was a 57% variance in readiness to use MOOCs, the remaining variance is unexplained. It might be because other factors could influence the research model. Additional studies could include more constructs, such as motivation during online learning (Ally et al., 2019) and learners' self-efficacy (Gameel & Wilkins, 2019), to better measure the students' readiness for MOOCs. Moreover, this study relied on a quantitative approach. In contrast, future studies might apply a mixed method to understand the different results of various studies in differing contexts. Furthermore, this study's data was collected from one university in Saudi Arabia, the University of Ha'il. Future studies might involve larger samples from more universities to enhance the generalizability of these findings.

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Appendix. The Questionnaires

Factor 1: Technical Competencies

1. I have a sense of self confidence in using computer technologies for specific tasks.
2. I am proficient in using a wide variety of computer technologies.
3. I feel comfortable using computers.
4. I can explain the benefits of using computer technologies in learning.
5. I am competent at integrating computer technologies into my learning activities.
6. I am motivated to get more involved in learning activities when using computer technologies.

Factor2: Social Competencies with classmates

(How confident are you that you could do the following social interaction tasks with your CLASSMATES in the ONLINE course?)

1. Develop friendship with my classmates.
2. Pay attention to other students' social actions.
3. Apply different social interaction skills depending on situations.
4. Initiate social interaction with classmates.
5. Socially interact with other students with respect.

Factor 3: Communication Competencies

1. I am comfortable expressing my opinion in writing to others.
2. I am comfortable responding to other people's ideas.
3. I am able to express my opinion in writing so that others understand what I mean.
4. I give constructive and proactive feedback to others even when I disagree.

Factor 4: Student Readiness to MOOCs (RM)

1: "I look forward to engage in MOOCs".
2: "I can commit the time needed to complete a MOOC".
3: "I would take up MOOCs if it is equivalent to a conventional course".
4: "I am ready to enroll in a MOOC".
5: "I like to learn more about MOOCs".
6: I am open for online assessments
7: I am willing to spend money on MOOCs