Fundamentals of Adjusting MOOCs in Acquiring Innovation Competencies

[1]Maximus Gorky Sembiring

Universitas Terbuka, Indonesia

[2]Gayuh Rahayu

IPB University, Indonesia
[1]gorky@ecampus.ut.ac.id, [2]gayuhrahayu@gmail.com

Abstract

Purpose – Observable arrangements in adjusting quality-satisfied massive open online courses (QS-MOOCs) related to Indonesia 4.0 were particularized in this study. It was expected to visualize its determinants observed by faculty related to endorsing innovation competencies. It was also of interest to disclose how and in what routines all attributes involved interrelated with one another.

Design/methodology/approach – An exploratory design (mixed methods) was utilized. A conceptual framework was established first by conducting activities consisting of a series of literature reviews and focus group discussions. QS-MOOCs includes presage, pattern, process, product, practicability, prospective, and power (7P). QS-MOOCs was viewed from scientific, technical, economic, and socio-cultural perspectives. QS-MOOCs preceded innovation competencies (critical thinking, creativity, and networking). The operational framework was then established with the 7P, QS-MOOCs, and innovation competencies as independent, moderating, and dependent variables respectively. The population was the faculty of Universitas Terbuka Indonesia. Respondents were randomly chosen to accumulate data through a survey of 631 academic staff. Methodically, importance-performance analysis (IPA) and a customer-satisfaction index (CSI) were emulated and then utilized to synchronously estimate the satisfaction level of QS-MOOCs and their degree of importance. Ten hypotheses were developed and then examined by applying structural equation modelling (SEM). This was meant to scrutinize the loading factor and interrelation power among the factors involved. Replies from 142 respondents were finally completed.

Findings – Statistically, seven out of the ten hypotheses examined were validated by the analysis. It was decisively recognized that product was the most significant determinant of QS-MOOCs, followed by power, practicability, pattern, and prospective. QS-MOOCs had direct control over critical thinking and creativity, whereas presage, process, and networking were excluded by the analysis. The study was also able to encounter 24 (out of 32) attributes as the pillars of QS-MOOCs. The quantitative frame was statistically satisfactory as of the nine cut-off values, seven were in the good-fit and two in marginal-fit categories.

Originality/value/implications – The qualitative framework seems defectively strengthened by the quantitative procedure. The study recognized that variance refers to the three invalidated hypotheses. A further in-depth review is required to find the motives and diminish plausible divergence. This can be done by searching for a more relevant approach, augmenting conjectural coverage, and/or enlarging the sample size.

Keywords: Indonesia 4.0, MOOCs, innovation competencies, IPA-CSI, SEM.

1 Introduction

The world is confronted by the Industrial Revolution 4.0. Indonesia then requires to be ready to enter the era of instability. This turbulence is leading to a rapid and wide transformation. Indonesia with a relatively high complexity observed from the population, geographical, and demographical constraints must be ready on these challenges. The blueprint of Making Indonesia 4.0 roadmap engaged stakeholders: government, industrial sectors, and research/educational institutions (Ministry of Industry, 2017). Commitments involved are compelled to turn the roadmap into success. Five sectors are named as a priority: food and drinks, automotive, textile, electronics, and chemicals. These are the five vital sectors in the world economy. Indonesia should be among the leading players. These sectors will boost the country's exports to a thriving role in the manufacturing sector towards Indonesia's gross domestic product (GDP).

During 2018-2030, Indonesia's GDP growth rates are predicted 6-7% per year. The manufacturing industry is pursued to contribute 21-26% to the nation's GDP by 2030. Job creation through the roadmap is estimated at 7-19 million. The roadmap involves 10 cross-sectoral national initiatives: improving the flow of goods, developing a roadmap for cross-sectoral industrial zones, improving sustainability standards, empowering the small and medium-sized entrepreneurs, building national digital infrastructure, attracting foreign investment, boosting the quality of local human resources, boosting ecosystem for innovation, designing incentives for investment in technology, and harmonizing regulations and policies. The idea of Making Indonesia 4.0 is in line with Industry 4.0 (Nagy et al., 2018) related to the needs for the 21st century skills, called innovation competencies (Watts et al., 2013). These trends are also highlighted by Bialik and Fadel (2015) and Liao et al. (2017). This implies that innovation has a vital role and Indonesia is therefore compelled to maintain ways of advancing National innovation competencies.

Having reflected in those settings, Universitas Terbuka should be approvingly involved as a higher education institution in the Indonesia context. The University, with open distance learning (ODL) mode, is compelled to contribute to coping with Making Indonesia 4.0 in advancing innovation competencies for the nations. Considering the population, geographical, and demographical restraints, ODL is suitable for advancing innovation competencies. One way of effectively contributing in this regard is to integrate massive open online courses (MOOCs) into the system as stated in the strategic plan of the University (Universitas Terbuka, 2017). Moreover, since 2017 the University has an additional role given by the Ministry of Research, Technology, and Higher Education to promote the Cyber University to higher education community and society in Making Indonesia 4.0. To attain this strategic plan it needs to provide quality satisfied MOOCs (QS-MOOCs) to support this emerging necessity.

In the previous work, Sembiring (2018a) observed the notions and dimensions of quality MOOCs behold by faculty. It was conceptually found that quality MOOCs involved six notions (6P: presage, process, product, practicability, prospective, and power). This is the elaboration of 3P: presage, process, and product by Biggs (1993). Besides, 6P leads to knowledge, skills, and professionalism. These findings were related to the main role of universities in creating, spreading knowledge, and other

academic entities with new approaches. The rise of the Internet and large-scale digitization of information (an advancement in ICT, Information Communication Technology) created more openings. They are openings to transform on how: (1) teaching-learning are developed and utilized, (2) knowledge-information are generated and distributed, and (3) students-staff-institutions interaction are facilitated and accommodated as highlighted by de Hart (2014) and adopted by Sembiring and Rahayu (2020). For this study, one dimension is appended, namely the pattern.

Having reflected on issues of Making Indonesia 4.0 (in accordance with Industrial Revolution 4.0 and the needs for the 21st century skills), Universitas Terbuka should support the government. Universitas Terbuka, with 35 years of experience, should take part in this movement. One way of contributing to nurturing National innovation competencies is by developing quality satisfied programs to support the industrial sectors. By having a kind of quality satisfied program, exclusively through MOOCs, the University is on the right path of making higher education open to all. The integration of QS-MOOCs in the Universitas Terbuka tradition will positively give benefits to educational stakeholders.

This inquiry is then instigated to elucidate possible determinants on developing QS-MOOCs perceived by faculty in accordance with Making Indonesia 4.0. Four main issues are explored further: (1) what are factors and attribute underpinning QS-MOOCs; (2) how are they interrelated one another and in what behavior; (3) how QS-MOOCs will support the idea of Making Indonesia 4.0; and (4) how QS-MOOCs are relevant for Indonesia 4.0 through Universitas Terbuka tradition?

2 Literature Reviews and the Frameworks

Conceptually, the exploratory framework of this inquiry starts with general perspectives on the MOOCs movement in Universitas Terbuka, illustrated in Figure 1.
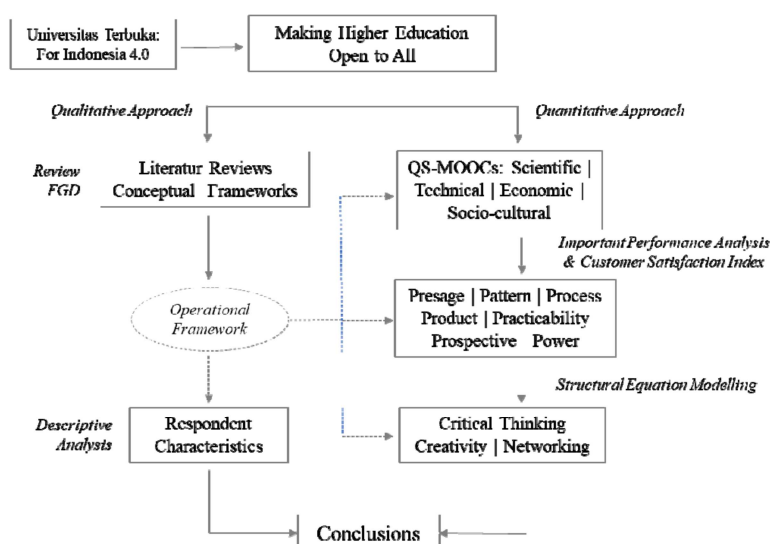

Fig. 1. The Conceptual Framework

This is the basis of the University to provide broader opportunities to "making higher education open to all" as the tagline of the University. This endeavor is related

to the advancement of innovation competencies (critical thinking, creativity, and networking) perceived by faculty especially in MOOCs movement in Universitas Terbuka related to Making Indonesia 4.0. The conceptual framework (Figure 1) is then utilized as a tool of weighing up QS-MOOCs and their inferences. This will let the University modifying important aspects related to the operational elements. It might focus on institutional directions to accomplish users' needs and expectations. The University will then be able to make progress on the growth of QS-MOOCs as stated in the formal document of the University. This is the way how the University is searching for proper orientation to maintain its function in eradicating access to quality education (Universitas Terbuka, 2018).

The QS-MOOCs were initially determined by 6P (Sembiring, 2018). The 6P is an extension of 3P (Biggs, 1993) and then elaborated by Hood and Littlejohn (2016). As emphasized by Gemage et al. (2015), this conceptual framework is essential issues to understand what drives motivation, interest, and changing the culture from "must learn" into "want to learn". The pedagogic aspect should remain the same as it was delivered in the traditional teaching and learning settings. In this report, quality satisfied measures for MOOCs were determined by seven main factors, i.e., the 7P (an enrichment of 3P and 6P). Each variable is then elaborated into dimensions/attributes related to the QS-MOOCs context. Besides, QS-MOOCs leads to critical thinking, creativity, and networking.

Conceptually, QS-MOOCs were relevant on the condition that they were scientifically provable, technically feasible, economically beneficial, and socio-culturally adaptable (Sembiring, 2017). This configuration had direct effects on critical thinking, creativity, and networking following Indonesia 4.0. Having finalized the conceptual framework, the study comes to elaborating and defining the operational framework. It was defined first that the origins of QS-MOOCs were 7P and it led to innovation competencies (Sembiring & Rahayu, 2020).

Operationally, presage (X_1) was defined as the first factor of QS-MOOCs that has a well-designed platform and it was methodically arranged by first considering user expectation. Pattern (X_2) was defined as the second factor that has a flexible format and arranged in a well-paced segment and complete. Process (X_3) was defined as the third factor considering the pedagogical aspect that it was systematically arranged to assure they are functional. Product (X_4) was defined as the fourth factor putting the user as the center of the interaction, well-presented, and appealing with premium quality. Presage, process, and product was inspired by Biggs (1993).

Correspondingly, practicability (X_5) was defined as the fifth factor innovatively developed so it gives advantage, affable, and manageability from the user perspective. Prospective (X_6) was defined as the sixth factor that has novelty and it is universally connected to the user as it includes relevant and current relevant insights. Power (X_7) was defined as the seventh factor that inspiring users with high satisfaction. Pattern, practicability, prospective, and power were adopted from Sembiring (2018a). These definitions were partly adopted and modified from Downes (2013), Lin et al. (2015), Littlejohn et al. (2016), Margaryan et al. (2015), and Hood and Littlejohn (2016).

QS-MOOCs (Y_1) was operationally defined as a condition where the ultimate product of MOOCs should be scientifically provable, technically feasible, economically beneficial, and socio-culturally adaptable (Sembiring, 2017; Sembiring

& Rahayu, 2020). Besides, critical thinking (Y_2) was defined as the power of QC-MOOCs to deliver critical analysis, estimating risk, evaluating the solution, and influencing the decision making process to the users. Creativity (Y_3) was defined as the function of QS-MOOCs to provide the ability in introducing a new idea, a new solution, starting a new activity, and executing a solution. Networking (Y_4) was defined as the potency of QS-MOOCs to support a sense of tolerance on differences, appreciating others, establishing a network, and maintain the network. These last elaborations were partly inspired by Bialik and Fadel (2015) and Liao et al. (2017).

Having defined variables and dimensions engaged, they are easier to comprehend as exhibited in Table 1.

Table 1. Variables and Dimensions Involved

No	Variables	Dimension	Notes
1	Presage X_1	X_{11}: Platform X_{12}: Well-design X_{13}: Methodical X_{14}: As expected by users	$X_1 - X_7$, Y_1 and $Y_2 - Y_4$ are correspondingly independent, intervening and dependent variables
2	Pattern X_2	X_{21}: Flexible X_{22}: Well-paced X_{23}: Organized X_{24}: Complete	Each variable has 4 dimensions; each dimension is accordingly measured by a single statement
3	Process X_3	X_{31}: Pedagogy X_{32}: Inclusive X_{33}: Systematic X_{34}: Functional	Statements included in $X_1 - X_7$ and Y_1 will be answered two times simultaneously by respondents
4	Product X_4	X_{41}: User-focused X_{42}: Well-presented X_{43}: Appealing X_{44}: Premium quality	The first answer of the statements is measuring their opinion (satisfaction) level; the second answer of the same statements is measuring the importance degree of their opinion
5	Practicability X_5	X_{51}: Innovative X_{52}: Advantageous X_{53}: Affable X_{54}: Manageable	
6	Prospective X_6	X_{61}: Novelty X_{62}: Corresponding X_{63}: Insightfull X_{64}: Universal	
7	Power X_7	X_{71}: Encouraging X_{72}: Inspiring X_{73}: Satisfying X_{74}: Maintanable	Y_1 was influenced by $X_1 - X_7$ $Y_2 - Y_4$ are influenced by Y_1
8	Quality MOOCs Y_1	Y_{11}: Scientifically proveable Y_{12}: Technically feasible Y_{13}: Economically beneficial Y_{14}: Socio-culturally adaptable	Statements included in $Y_2 - Y_4$ are answered just one time with one statement for one dimension accordingly
9	Critical thinking Y_2	Y_{21}: Critical analysis Y_{22}: Estimating risk Y_{23}: Evaluating solution Y_{24}: Influencing decision making	Total statements: $[(32x2) + (1x12) + 1*] = 77$
10	Creativity Y_3	Y_{31}: New idea Y_{32}: New solution Y_{33}: Starting new activity Y_{34}: Executing solution	The last one statement [*] is on the overall perception of respondents about the whole existing quality MOOCs provided and publicly offered by the University for everybody
11	Networking Y_4	Y_{41}: Tollerance on differences Y_{42}: Appreciating others Y_{43}: Establishing networking Y_{44}: Maintaining networking	

At this stage, dimensions/attributes elaborated are fundamentals followed from the conceptual framework. It is then utilized as a basis to propose the operational framework. Prior to launching the operational frame, it is worth noting that QS-

MOOCs (Y_1) were determined by 7P (X_1-X_7). QS-MOOCs (Y_1) was to deliver innovation competencies. Innovation competencies are related to Making Indonesia 4.0 as an approach in preparing the golden generation towards 2045 (100 years of Indonesia as an independent nation) viewed from the Universitas Terbuka tradition.

3 Research Design and Hypotheses

The next step is to establish the operational framework by considering the grand design (Figure 1) and the variables/dimensions involved (Table 1). This framework is utilized as a basis to determine the design of the study, methodology, analysis, and inferring the conclusion (Figure 2).
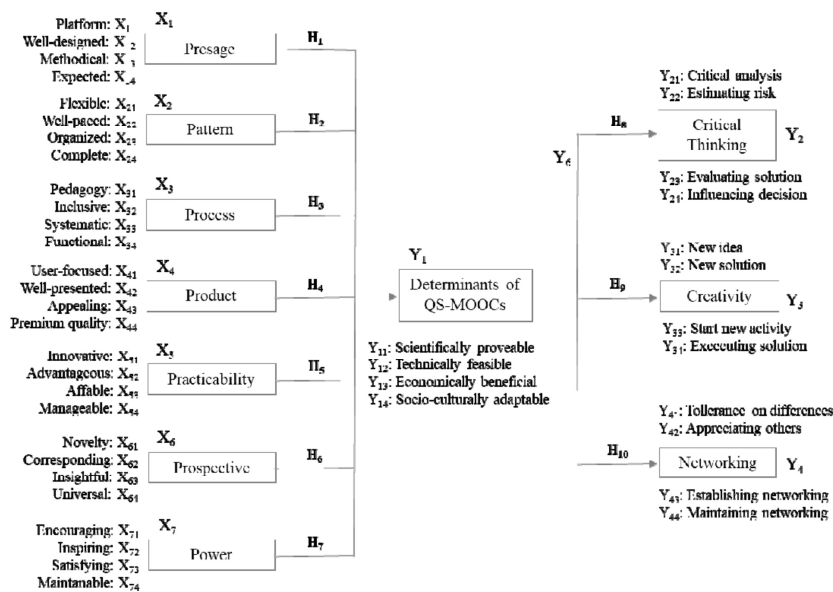

Fig. 2. The Operational Framework

This inquiry uses mixed methods: exploratory design (Creswell & Clark, 2011). It is prearranged under a qualitative procedure first and then followed by a quantitative approach. Two kinds of instruments were developed. They are a list of questions for the focus group discussions (qualitative process) and questionnaire to accumulate data from respondents (quantitative purpose). Table 1 and Figure 2 underlined the basics of QS-MOOCs related to developing innovation competencies and it includes scientific, technique, economic, and socio-cultural attributes.

QS-MOOCs (Y_1) was assessed by perceiving dimensions/attributes of: X_1 (presage: platform, well-designed, methodical, and expected), X_2 (pattern: flexible, well-paced, orderly, and complete), X_3 (process: pedagogy, inclusive, systematic, and functional), X_4 (product: user-focused, well-presented, appealing, and premium quality), X_5 (practicability: innovative, advantageous, affable, and manageable), X_6 (prospective: novelty, corresponding, and universal), and X_7 (power: encouraging, inspiring, satisfying, and maintainable).

An instrument for qualitative processes included four specific queries. (1) What are the conceivable factors (dimensions/attributes) with respect to developing QS-MOOCs. (2) How the behaviors of factors involved interrelated are exemplified. (3)

How QS-MOOCs are tightly related to the idea of Making Indonesia 4.0. (4) What are the basic ideas that QS-MOOCs relevant to developing human capital through the Universitas Terbuka tradition.

The instrument for quantitative approach consisted of 77 statements $[(32x2)+(1x12)+1]=77$]. They are the Likert Scale (1-5) related to QS-MOOCs satisfaction and their importance degree. It also included 17 statements to validate independent variables (and dimensions) with respect to QS-MOOCs as moderating variables (Table 1). The questionnaire is explored by considering variables/dimensions engaged inspired by Shahzavar and Tan (2011). Purposive sampling was chosen to select four experts for qualitative purposes and simple random sampling to determine eligible respondents for quantitative purposes (Cochran, 1977). A survey was started to collect data from respondents (Fowler, 2014). An important-performance analysis and customer-satisfaction index (IPA-CSI) were emulated and used to simultaneously measure the satisfaction level of QS-MOOCs along with their importance degree (Wong et al., 2011). Structural-equation modeling (SEM) is used to detect relations power among variables engaged (Hair et al., 2009 and Marks et al., 2005).

This inquiry establishes and then scrutinizes ten hypotheses (H_1-H_{10}, Figure 2). QS-MOOCs were influenced by: presage (H_1), pattern (H_2), process (H_3), product (H_4), practicability (H_5), prospective (H_6), and power (H_7). Furthermore, critical thinking (H_8), creativity (H_9), and networking (H_{10}) were influenced by QS-MOOCs. These 10 hypotheses will be examined under the SEM technique to validate relations amongst variables/dimensions engaged. The validation is aimed at examining the significance level of the relations and it is used to scrutinize the power of all relations.

4   Results and Arguments

Prior to conferring the result, it is good to note the highlight of respondents' characteristics (Table 2). This will induce our perception of how to interpret the outcomes more properly.

Table 2. Respondents Characteristics

Respondents=142 (631)	%	%	%	%	%
Faculty of	Education = 45	Social = 18	Economics = 19	Sciences = 18	
Echelon	One = 0	Two = 2	Three = 2	Four = 3	Non-Ech = 93
Work Experience *year*	1–5 = 3	6–10 = 19	11–15 = 30	16–20 = 38	≥ 21 = 10
Age *year*	≤ 30 = 2	31–40 = 14	41–50 = 27	51–60 = 44	≥ 61 = 13
Involved in OER *year*	< 2 = 1	2–3 = 16	4–5 = 36	6–7 = 32	≥ 8 = 15
Position	Professor = 1	Senior = 18	Junior = 77	Assistant = 1	Candidate = 3
Background	S3 = 11	S2 = 89	Office	Central = 53	Regional = 47

The population was 631 academic staff of Universitas Terbuka; and 142 of them were accomplished the questionnaires. Almost half of the respondents are from the Faculty of Education. They all can be categorized as experienced and senior staff with five years or more involvement in MOOCs. More than half are working in the central office and the rest are domiciled in other 40 regional offices. Most of them are aware of the MOOCs movement as the University's academic (part of the academic

community) related to Indonesia 4.0. This implies that the insights accumulated were satisfactory.

The hypothesis analysis. The statistical analysis reveals three of the 10 hypotheses examined are not validated by the analysis (Figure 3). They are: presage (H_1) and process (H_3) with respect to QS-MOOCs and so is QS-MOOCs to networking (H_{10}), as the $p_{-value} \leq 1.96$, for $\alpha = 5\%$. Whereas the seven hypotheses are authenticated, as the $p_{-value} \geq 1.96$, for $\alpha = 5\%$. The validated hypotheses are: pattern (H_2), product (H_4), practicability (H_5), prospective (H_6), and power (H_7) with respect to QS-MOOCs and so is QS-MOOCs to critical thinking (H_8) and creativity (H_9).
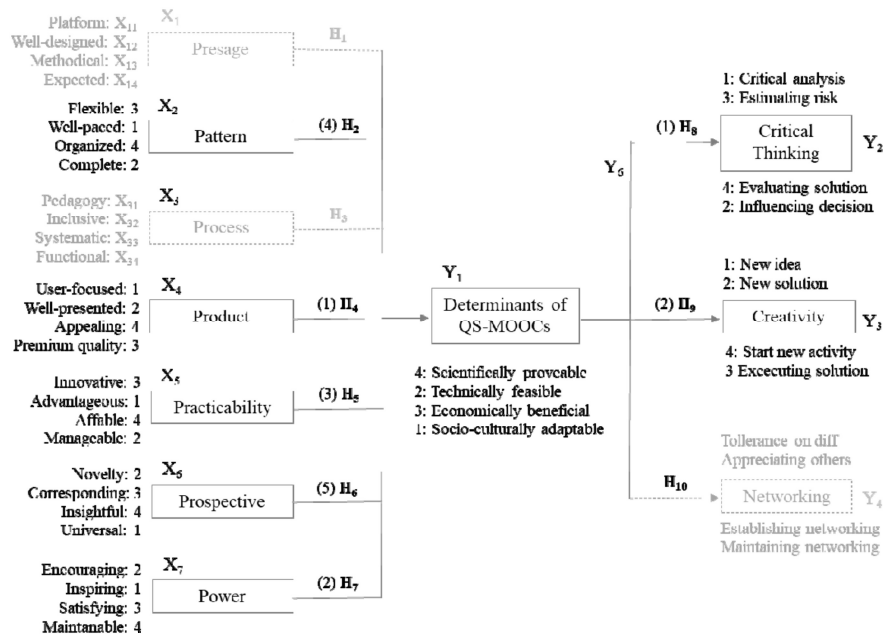

Fig. 3. The Hypotheses Analysis and the Loading Factors

Prior to elucidating relations power amongst factors engaged, let us first reveal the satisfaction level of QS-MOOCs and the degree of their importance resulted from IPA-CSI analysis. The analysis engenders attributes related to the relevant quadrants to distinguish their behavior.

Graphically, IPA-CSI Chart has four quadrants (Q) as illustrated in Figure 4. Q_1 indicates QS-MOOCs attribute is at a low level while the degree of its importance is high. Q_2 indicates both QS-MOOCs attribute and the degree of its importance are being placed at a high level. Q_3 indicates QS-MOOCs attribute and degree of its importance are at a low level. Q_4 indicates QS-MOOCs attribute is in the low level of importance, high in satisfaction following Deng and Pierskalla (2018).

Q_1 **[Concentrate Here]**. Three out of 32 attributes (Figure 4) fall in this quadrant. They are: economically beneficial (Y_{13}), complete (X_{24}), and innovative (X_{51}). This implies that the University must notice these attributes seriously. They are important but low in satisfaction. It implies that most faculty have already been aware of the movement related to Indonesia 4.0, the QS-MOOCs should be economically beneficial, complete, and innovative.

Q_2 **[Maintain Performance]**. There are 24 attributes fall in this quadrant (Figure 4). They are: platform (X_{11}), well-design (X_{12}), and expected (X_{14}); flexible (X_{21}),

well-paced (X_{22}), and organized (X_{23}); inclusive (X_{32}) and systematic (X_{33}); user-focused (X_{41}), well-presented (X_{42}), appealing (X_{43}), and premium quality (X_{44}); advantageous (X_{52}), affable (X_{53}), and manageable (X_{54}); novelty (X_{61}), corresponding (X_{62}), insightful (X_{63}), and universal (X_{64}); encouraging (X_{71}), inspiring (X_{72}), and satisfying (X_{73}); scientifically provable (Y_{11}), technically feasible (Y_{12}), and socio-economically (Y_{13}) adaptable. The University must take care of these attributes as they are the best basics of QS-MOOCs. Attributes fall in this quadrant are the strengths and pillars of promoting QS-MOOCs in Universitas Terbuka in terms of Indonesia 4.0. Besides, these 24 attributes should become the pride of the University as a basis of developing QS-MOOCs. Providentially, most respondents have been aware of these attributes as an assurance to provide QS-MOOCs.
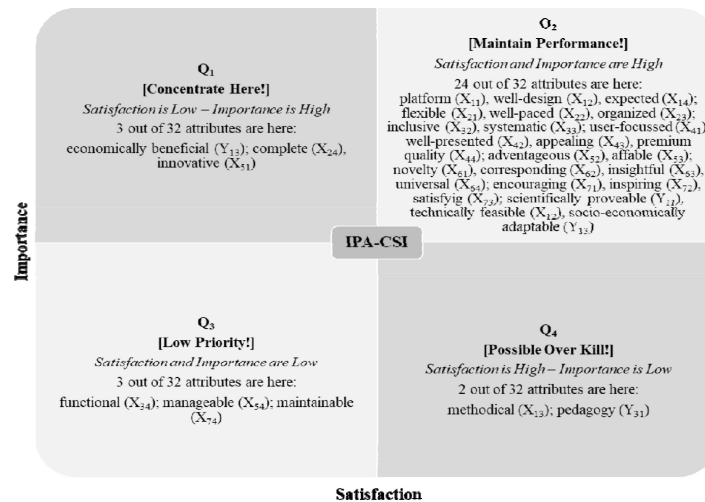

Fig. 4. The IPA-CSI Chart

Q_3 **[Low Priority]**. Three attributes fall in this quadrant (Figure 4). They are: functional (X_{34}), manageable (X_{54}), and maintainable (X_{74}), The university should classify these as the next focus after concentrating to maintain critical points in Q_2. Any attribute falling into this quadrant is not critical and poses no threat. The University may redirect resources to attributes fall in Q_1, shift them into Q_2.

Q_4 **[Possible Over Kill]**. Two points as members of this quadrant (Figure 4). They are: methodical (X_{13}) and pedagogy (X_{31}). Attention to attributes in this quadrant can be less focused. The university can save costs by redirecting them to take up vital spots by anticipating no attributes will fall again into Q_1 and keep maintaining fundamental spots in Q_2.

Having positioned attributes in accordance with the IPA-CSI chart, it is time to relate the loading factors to observe the power of relations of each variable under SEM to work out the outcomes (Marks et al., 20015 and Hair et al., 2009). Five critical upshots need to be elaborated further; refer to Figure 3.

1. The first was related to the variables/dimensions that directly influenced QS-MOOCs. They are: product (X_4) followed by power (X_7), practicability (X_5), pattern (X_2), and prospective (X_6). While QS-MOOCs are not influenced by both presage (X_3) and process (X_3) and so is QS-MOOCs with respect to networking (Y_4).

2. The second is on the order of attributes in the product (X_4): user-focused (X_{41}), well-presented (X_{42}), premium quality (X_{44}), and appealing (X_{43}). The order of attributes in power (X_7): inspiring (X_{72}), encouraging (X_{71}), satisfying (X_{73}), and maintainable (X_{74}). The order of attributes in practicability (X_5): advantageous (X_{52}), manageable (X_{54}), innovative (X_{51}), and affable (X_{53}). The order of attributes in the pattern (X_2): well-paced (X_{22}), complete (X_{24}), flexible (X_{21}), and organized. The order of attributes in prospective (X_6): universal (X_{64}), novelty (X_{61}), corresponding (X_{63}), and insightful (X_{63}).

3. The third is related to the power of the relations of moderating variable and dependent variables. QS-MOOCs has significant effects on critical thinking (Y_2) and creativity (Y_3); networking (Y_4) to QS-OER was excluded by the analysis.

4. The fourth is the order of attributes in QS-MOOCs: socio-culturally adaptable (Y_{14}) followed by technically feasible (Y_{12}), economically beneficial (Y_{13}), and scientifically provable (Y_{11}).

5. The fifth concern is on the rank of attributes within critical thinking (Y_2): critical analysis (Y_{21}), influencing the decision (Y_{24}), estimating the risk (Y_{22}), and evaluating solution (Y_{23}). The rank of attributes in creativity (Y_3): new idea (Y_{31}), new solution (Y_{32}), executing solution (Y_{34}), and start a new activity (Y_{33}).

Before validating a comprehensive conclusion under the mixed methods, we need to reflect whether or not the SEM output is methodically in the "good-fit" category. If so, it is then reliable to utilize the analysis and engender the loading factors to confirm the power of interrelations (Table 3).

Table 3. The Goodness-of-Fit of the Tested Framework

Goodness of Fit	*Cut-off Values*	*Results*	*Notes*
RMR Root Mean Square Residual	≤ 0.05 or ≤ 0.10	0.08	Good Fit
RMSEA Root Mean Square Error of Approx	≤ 0.08	0.08	Good Fit
GFI Goodness of Fit	≥ 0.90	0.91	Good Fit
AGFI Adjusted Goodness of Fit Index	≥ 0.90	0.91	Good Fit
CFI Comparative Fit Index	≥ 0.90	0.88	Marginal Fit
NFI Normed Fit Index	≥ 0.90	0.91	Good Fit
NNFI Non-Normed Fit Index	≥ 0.90	0.92	Good Fit
IFI Incremental Fit Index	≥ 0.90	0.90	Good Fit
RFI Relative Fit Index	≥ 0.90	0.89	Marginal Fit

The analysis confirmed they were considered satisfactory. Seven were in good-fit and two in marginal-fit categories (Table 3). It means the validated framework was dependable. Likewise, three estimations ought to be explored. The first is on the gap obtained using an exploratory design. The second is the reasons adjacent to the respondents' characteristics. The third is the implication of finding for a future query.

First. QS-MOOCs were qualitatively interrelated with 7P. The moderating variable was interconnected with independent variables. There were two dimensions of independent variables (presage and process) that were not quantitatively interrelated, and so is QS-MOOCs to the dependent variable (networking). This implied that qualitative and quantitative results varied despite they did not substantially contradict one another. The exploratory design was conducted by synthesizing related theories and end up with hypothesis development. A quantitative frame is then established prior to hypotheses interpretation (Creswell and Clark, 2011)

to assess the qualitative aspects of exploratory findings. Before building the operational, the conceptual framework should be first established as it will be statistically scrutinized. The results showed three hypotheses were not approved. The order of dimensions/attributes in the initial framework was disharmony as compared to the quantitative end. The quantitative imperfectly approved qualitative discoveries.

Second. Most respondents were reasonably qualified in MOOCs (table 2) observed from background, position, working experience, age, and qualification. The majority have had adequate experience in MOOCs. It is then plausible that they might be able to foresee QS-MOOCs as a good attempt to developing critical thinking and creativity. Unfortunately, networking is not included as a way of developing human capital in Making Indonesia 4.0. As the respondents are all academic, mainly involved in teaching and learning, they are able to foresee how QS-MOOCs is suitable to enhance the strength of the nations by equipping human capital to improve their critical thinking and creativity through ODL approach.

Third. Future research can involve users/experts from other institutions. There must be a balance between qualitative and quantitative outcomes. Whatever we do, it is important to bear in mind that we are in the position to prepare and promote effective QS-MOOCs. These efforts are to promote lifelong learning to the world, especially for preparing Indonesia golden generation on the road to 2045 (100 years of Indonesia as an independent nation).

5   Concluding Remarks

The University has been in service since 1984 with 1,6 million graduates and serving 300,000 students per semester. It is believed that Universitas Terbuka is on the right path to contribute through the provision of QS-MOOCs towards Making Indonesia 4.0. The study is conclusively able to clarify determinants underpinning QS-MOOCs: product, power, practicability, pattern, and prospective. The result is also able to expose how and in what behaviors they were interrelated with one another. QS-MOOCs through Universitas Terbuka is relevant to develop critical thinking and creativity provided they are complete, innovative, and economically beneficial related to Making Indonesia 4.0. This can be attained by prudently maintaining 24 attributes in Q_2 and shifting three attributes in Q_1 into Q_2.

The study has discovered slight variations between qualitative and quantitative approaches. Three of 10 hypotheses were invalidated. This implied the established qualitative framework was imperfectly approved by quantitative analysis. Further inquiry is therefore needed by enlarging the scope of the study and inviting other communities from other related institutions as respondents and/or experts. This is to find motives why they are varied and at the same time searching for an approach to make the consequences closer under exploratory design.

References

Bialik, M. and Fadel, C. (2015). *Skills for 21st Century: What Should Student Learn?* Boston: Center for Curriculum Redesign. Retrieved 26 April 2019 from http://www.curriculumredesign.org

Biggs, J. (1993). From theory to practice: a cognitive systems approach. *Higher Education Research & Development*, *12*(1), 73-85. Retrieved 2 March 2019 from http://dx.doi.org/10.1080/0729436930120107

Cochran, W. G. (1977). *Sampling Techniques*. 3rd ed. New York: John Wiley & Sons.

Creswell, J. W. and Clark, V. L. P. (2011). *Designing and Conducting Mixed Methods Research*. 2nd ed. Los Angeles: Sage Publication.

de Hart, K. (2014). *OER Strategy 2014-2016 of the University of South Africa*. Office of the Pro-Vice-Chancellor, the University of South Africa.

Deng, J. and Pierskalla, C. D. (2018). Linking importance-performance analysis, satisfaction, and loyalty: A study of Savannah, GA. *Sustainability*, *10*(704), 1-17. Retrieved 27 April 2019 from www.mdpi.com/journal/sustainability (DOI:10.3390/su10030704)

Downes, S. (2013). The quality of massive open online courses. Retrieved 24 April 2013 from http://mooc.cfquel.org/files/2013/05/week2-The-quality-of-massive-open-online-courses-StephenDownes.pdf

Fowler, F. J. Jr. (2014). *Survey Research Methods*. 5th ed. Los Angeles: Sage Publication.

Hair, J. F. Jr., Black, W. C. Babin, B. J. and Anderson, R. E. (2009). *Multivariate Data Analysis with Readings*. 7th ed. New Jersey: Prentice Hall, Inc.

Hood, N. and Littlejohn, A. (2016). *Quality in MOOCs: Surveying the Terrain*. Burnaby, Canada: Commonwealth of Learning.

Liao, Y. Loures,, E. R. Deschamps, F., Brezinski, G. and Venancio, A. (2017). The impact of the fourth industrial revolution: a cross-country/region comparison, *Production*, *28*, 2-28. Retrieved 27 April 2019 from http://www.scielo.br/pdf/prod/v28/0103-6513-prod-28-e20180061.pdf (DOI: 10.1590/0103-6513.20180061)

Lin, Y-L., Lin, H-W. and Hung, T-T. (2015). Value hierarchy for massive open online courses. *Computers in Human Behavior*, *53*(C), 408-418.

Littlejohn, A., Hood, N., Milligan, C. and Mustain, P. (2016). Learning in MOOCs: motivations and self-regulated learning in MOOCs. *Internet and Higher Education*, *29*, 40-48.

Margaryan, A., Bianco, M. and Littlejohn, A. (2015). Instructional quality of massive open online courses. *Computers & Education*, *80*(2015), 77-83.

Marks, R. B., Sibley, S. D. and Arbaugh, J. B. (2005). A structural equation model of predictor for effective online learning. *Journal of Management Education*, *29*(4), 531-563.

Masterman, L., Wild, J. White, D. and Manton, M. (2011). The impact of OER on teaching and learning in UK universities: implications for learning design. In Cameron, L. and Dalziel, J. (Eds). *Proceedings the 6th International LAMS & Learning Design Conference*, LAMS Foundation, Sydney, 135-144. Retrieved 9 July 2015 from http://lamsfoundation.org/lams2011sydney/papers.htm

Ministry of Industry Republic of Indonesia (2017). *Industry: Fact and Figures 2017*. Jakarta: Ministry of Industry. Retrieved 24 April 2019 from www.kemenperin.go.id

Nagy, J., Olah, J., Erdei, E., Mate, D. and Popp, J. (2018). The role and impact of industry 4.0 and the internet of things on business strategy of the value chain – the case of Hungary. *Sustainability*, *10*(3491), 1-25. DOI:10.3390/su10103491. Retrieved 26 April 2019 from www.mdpi.com/journal/sustainability

Penttila, T. and Kairisto-Mertanen, L. (2013). Developing Innovation Competencies through Boundary Crossing in a Social Learning Environment, in Report on *Pedagogical Views on Innovation Competencies and Entrepreneurship: Innovation Pedagogy and other Approaches*. Editor Lehto, A & Penttila, T.

Sembiring, M. G. (2017). Exploratory study of academic excellence associated with persistence in ODL setting. *Asian Association of Open Universities Journal*, *12*(2), 125-136. Retrieved 27 April 2019 from https://doi.org/10.1108/AAOUJ-01-2017-0015

Sembiring, M. G. (2018a). Modeling the notions and dimensions of MOOCs. *Asian Association of Open Universities Journal*, *12*(1), 100-114. Retrieved 27 April 2019 from https://doi.org/10.1108/AAOUJ-01-2018-0007

Sembiring, M. G. (2018b). Validating student satisfaction with a blended learning scheme in Universitas Terbuka setting. *International Journal for Mobile Learning and Organisation*, *12*(4), 394-412. DOI:10.1504/IJMLO.2018.095166. Retrieved 27 April 2019 from http://www.inderscience.com/offer.php?id=95166

Sembiring, M. G. and Rahayu, G. (2020). What makes quality satisfied OER? Insights from Universitas Terbuka for Indonesia 4.0. *Interactive Technology and Smart Education*, *Vol ahead-of-print* (*No ahead-of-print*). Retrieved 16 May 2020 from https://www.emerald.com/insight/1741-5659.htm - https://doi.org/10.1108/ITSE-10-2019-0071

Shahzavar, Z. and Tan, B. H. (2011). Developing a questionnaire to measure students' attitude toward the course blog. *Turkish Online Journal of Distance Education*, *13*(1), 200-210.

Universitas Terbuka. (2017). *Rencana Strategi Bisnis UniversitasTerbuka 2017-2020*. Tangerang Selatan, Indonesia: Universitas Terbuka.

Universitas Terbuka. (2018). *UniversitasTerbuka Yearly Report of 2017*. Tangerang Selatan, Indonesia: Universitas Terbuka.

Watts, F., Aznar-Mas, L.E., Penttila, T., Kairisto-Mertanen, L., Stange, C. and Helker, H. (2013). Innovation Competency Development and Assessment in Higher Education, *Proceedings of INTED2013 Conference*, 4-6 March 2013, Valencia, Spain.

Wong, M. S., Hideki, N. and George, P. (2011). The use of IPA in evaluating Japan's e-government services. *Journal of Theoretical & Applied Electronic Commerce Research*, *6*(2), 17-30. Retrieved 9 July 2015 from http://www.jtaer.co