

MEASUREMENT INSTRUMENTS for the DIGITAL TRANSFORMATION in SCHOOLS

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ABSTRACT

The digital transformation is starting to enter the world of education triggered by the pandemic. A fundamental characteristic that determines the success of the digital transformation is the response to the changes. Other characteristics are processes, technology and management in schools. Digital transformation measurement instruments are created by following the standard steps of instrument design. Validity and reliability tests were carried out to prove that the created instruments are feasible to use.

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INTRODUCTION

Digital transformation is a new phenomenon that is growing rapidly since it was triggered by the wave of the 2020 *Covid* pandemic (Cahaya et al., 2022). Digital transformation is the integration of digital technology into all areas of business that results in fundamental changes to the way businesses operate and how these changes provide value to customers, including the education sector. (Balyer & Öz, 2018)

One indication of the occurrence of digital transformation is the integration of digital technology into every process, which in the field of education can be related to service and evaluation processes, teaching technologies, and management that utilizes digital technology. It is not just the implementation of digital technology by changing manual work methods to become automatized with the help of digital technology but it is causing fundamental changes in educational process services. The results of the digital transformation are perceived as an extraordinary change for consumers (Pousttchi et al., 2019a).

The corona virus pandemic that occurred in 2019 had had a significant change in various sectors. Suddenly all face-to-face learning activities had to be replaced by digital communication media so that learning took place remotely or online. This condition did encourage schools and teachers to seek learning models and tools to optimize distance learning (Listiyoningsih et al., 2022). Various devices are used with messaging applications like whatsapp, telegram, and conferencing applications such as Gmeet, Zoom, Ms.Teams, learning management system applications such as google classroom, moodle, and many more, depending on the capabilities of the schools. The sudden change in learning methods forced teachers to learn to get used new ways of working by utilizing digital technology (Ilomäki & Lakkala, 2018).

However, can we say, that schools that have carried out distance or online learning actually carried out digital transformation? What are the indicators of schools that have carried out digital transformation? This study aims to create instruments to measure whether a school has made basic steps or is halfway through or is mainly relying on digital methods.

Digital transformation implements a basic change in methods a management of education (Pousttchi et al., 2019b). Changes can only occur when the included and affected people show a positive response. Digital transformation affects three basic matters, namely learning processes, used technology, and management. During the pandemic the learning processes in schools needed to make use of digital technology to overcome the breakdown of direct communication. Technology means infrastructure facilities related to digital technology used to organize learning in schools. Support for infrastructure such as computer laboratories, gadgets, internet networks both provided by schools and teachers personally. While management means school management standards. Once the scope of school management is so broad, it will only be limited to managing personal and digital competencies.

METHODS

The instrument design follows these steps:

- (1) formulating the variables to be measured which are built from understanding or concepts,
- (2) developing the dimensions and indicators of the variables to be measured,
- (3) creating an instrument grid that contains dimensions, indicators, item number, number of items,
- (4) setting parameters moving from one pole to another or setting a scale as an option,
- (5) writing questions developed from indicators,
- (6) conducting theory validation, namely expert validation,
- (7) revise the instrument,
- (8) test the instrument,
- (9) conduct construct validation based on test results data,
- (10) calculate reliability,
- (11) filter valid and reliable question items to be used as measuring instrument,
- (12) use instrument to measurement.

Expert validation is carried out through two stages, namely content validation and readability or language validation. The trial sample was selected by 200 Jakarta State Senior High School students. Calculation of the validity test by experts is done with the V-aiken formula, namely:

$$V = \frac{\sum s}{n(c-1)}$$

V is the expert agreement index; s is the score assigned by each expert minus the lowest score in the category; n is the number of experts; c is the number of categories obtained by the expert.

The number of experts is 3 people, so that with an error percentage of 5% a question item can be accepted or said to be valid if the value of $V \geq 0.92$. Construct validity test, using factor analysis through the IBM-SPSS v25 program. An item is said to meet the sample coverage if the Kaiser-Meyer-Olkin (KMO) value ≥ 0.50 , and is said to be valid if the matrix component value is ≥ 0.4

In addition to the validity test to see the accuracy of the measurement, a reliability test was also carried out to see the constancy of the measurement results. The reliability

test was carried out with the help of the IBM-SPSS v25 program. The reliability test is used to measure the consistency of the measurement results. The questions are said to be reliable if the Cronbach's alpha value is ≥ 0.7 .

RESULTS AND DISCUSSION

Digital transformation measurement instrument uses a scale of 1-5, as in table 1 below:

Table 1 : Digital Transformation Measurement Instrument

Dimension	No. of Questions per dimension	No. of Question Items in the questionnaire	Question Item
Response to Change	1	1	I am not burdened with many technical preparations (providing devices, internet network, learning to use new applications) to take part in online learning
	2	2	I realize that changes must be made in order to keep up with the times.
	3	3	I am able to adapt to distance/online learning
	4	4	I like to learn new things
Process	1	5	I prefer distance/online learning to be done synchronously rather than asynchronously
	2	6	Opening the camera is essential during online learning
	3	7	Synchronous learning online helps me better understand the material than asynchronous
	4	8	Distance/online learning is synchronously interesting/interactive
Technology	1	9	Utilization of interactive video conferencing media in distance/online learning
	2	10	Utilization/use of Learning Management System (LMS) in distance/online learning
	3	11	Utilization of learning resources provided in electronic form to support distance/online learning
	4	12	Online discussion forums are used to support distance learning
Management	1	13	Schools facilitate the improvement of teachers' digital competence (example: training on using google classroom, zoom, Gmeet, etc.)
	2	14	Schools require teachers to use various kinds of applications/software to support learning
	3	15	The 'paperless' concept applied in schools encourages faster use of digital technology
	4	16	Collaboration between schools and other parties encourages the acceleration of the implementation of digital technology.
Digital Transformation	1	17	My school swiftly changed face-to-face learning to distance/online learning
	2	18	My school has implemented various applications to support online learning

Dimension	No. of Questions per dimension	No. of Question Items in the questionnaire	Question Item
	3	19	My school has sufficient infrastructure (computer equipment, internet network, <i>learning management system</i>) to carry out distance/online learning
	4	20	Teachers are skilled in using applications that support online learning
	5	21	'paperless' culture is implemented in schools.

The results of the validity test by experts by calculating the V-aiken index obtained that all question items had an index value ≥ 0.92 so that all items were said to be valid.

The results of the empirical validity test related to sample adequacy by looking at the Kaiser-Meyer-Olkin (KMO) value are obtained as in table 2 below:

Table 2: Sample adequacy test results

Dimensions	Kaiser-Meyer-Olkin (KMO) Value
Response to Change	0.798
Process	0.753
Technology	0.794
Management	0.799
Digital Transformation	0.862

The sample adequacy standard has been met if the KMO value ≥ 0.50 . From the results of the KMO calculation, all dimensions meet the adequacy of the sample.

Test the construct validity through factor analysis by looking at the matrix component values produced as in table 3 below.

Table 3: Construct validity test results

Dimensions	Question Item Number	Matrix Component Value
Response to Change	1	0.886
	2	0.814
	3	0.882
	4	0.733
Process	5	0.844
	6	0.861
	7	0.643
	8	0.741
Technology	9	0.862
	10	0.854
	11	0.783
	12	0.812
Management	13	0.905
	14	0.638
	15	0.910
	16	0.901
Digital Transformation	17	0.786
	18	0.886
	19	0.859
	20	0.857
	21	0.870

All questions show a matrix component value of ≥ 0.4 , thus all of these questions are said to be valid.

After the validity test, it is continued with a reliability test using Cronbach's alpha, and the results are as shown in table 4 below.

Table 4: Cronbach's alpha reliability test results

Dimensions	Reliability Value
Response to Change	0.841
Process	0.755
Technology	0.842
Management	0.862
Digital Transformation	0.900

Based on the test results above, it shows that the reliability value of Cronbach's alpha is ≥ 0.7 , this indicates that the instrument provides reliable or consistent results.

The main objective of this research is to create a digital transformation measurement instrument in schools. This instrument is important to provide considering the rapid development of technology to support the learning process in schools. Digital transformation is not only limited to the implementation of technology, but the scope is wider and the most basic is the response of school members regarding change.

Making the instrument has gone through the stages that should be in accordance with the theoretical study. The dimensions of response to change, process, technology and management are dimensions that build digital transformation in schools. The validity and reliability tests carried out produced a value that met the requirements for this instrument to be used.

The limitations of this study are only looking at 4 dimensions, but actually other dimensions can still be explored. Within these dimensions, the indicators that compose them can still be developed. Furthermore, this instrument needs to be used in real terms to measure digital transformation in schools

CONCLUSION

Digital transformation in schools is determined, among other things, by the response to change, the learning process, the technology used and school management, especially in the competence of teaching staff. There are still other dimensions that determine the occurrence of digital transformation in schools that have not been examined in this study.

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