

**From:** EJEL [mailto:[acpiforms@gmail.com](mailto:acpiforms@gmail.com)]  
**Sent:** 30 April 2018 15:05  
**To:** [lantip@uny.ac.id](mailto:lantip@uny.ac.id)  
**Cc:** EJEL Submissions  
**Subject:** EJEL Paper Submission Form Successfully Submitted

We have received your paper submission. Do not reply to this email address. If you have a query email [submissions@ejel.org](mailto:submissions@ejel.org). The details of your submission follow:

Timestamp :: 4/30/2018 15:04:55  
Contact Author Surname :: Lantip  
Contact Author Given Name :: Diat Prasajo  
Contact Author Email Address :: [lantip@uny.ac.id](mailto:lantip@uny.ac.id)  
Co-Author Surname :: Mukminin  
Co-Author Given Name :: Amirul  
Co-Author Email Address :: [amirmuk06@gmail.com](mailto:amirmuk06@gmail.com)  
Other Authors? :: Yes  
If Yes how many? :: 4  
Paper Title :: Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study  
I confirm that I have read and agree with the terms and conditions as listed above. :: Confirm  
What category of submission are you making? :: Empirical Research

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Thank you, Meryl.  
I am still waiting.  
Looking forward to having a good news.

On Wed, May 9, 2018 at 9:17 AM, lantip d. prasojo <lantip@uny.ac.id> wrote:  
Dear Meryl,

Thank you for your email.  
Looking forward to having the editors' decision.

Best wishes

Lantip

On Wed, 9 May 2018, 05:18 EJEL, <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:

Dear Lantip

This is a note to acknowledge receipt of your paper submission to EJEL.

I have forwarded your paper to the Editor for evaluation. Should your submission be acceptable to the Editor it will be sent out for double blind peer review.

I will keep you advised as to how your submission is progressing.

Please quote the above reference number on all future communications regarding this submission, as omitting it may delay our reply.

With thanks  
Regards  
Meryl Toomey  
Journal Administrator

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On Mon, May 26, 2018 at 4:57 PM, EJEL <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:

Dear Lantip

The editors of EJEL have completed their initial evaluation of your paper and they have requested that it be put into the double blind review process.

I have today sent your paper to the associate editor, who will provide me with the name of two reviewers for it, and I will be back in touch with you when I have received their feedback.

Regards

Meryl Toomey  
Journal Administrator

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**From:** lantip d. prasojo [lantip@uny.ac.id]  
**Sent:** 27 May 2018 10:24  
**To:** EJEL  
**Subject:** Re: EI 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

Dear Meryl,

Kindly inform me the submission progress of *EI 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study*.

Best wishes

Lantip

On Mon, May 28, 2018 at 4:57 PM, EJEL <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:

Dear Meryl,

Is there any progress with the review?

*EI 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study.*

Best wishes

Lantip

**From:** lantip d. prasojo [lantip@uny.ac.id]

**Sent:** 08 June 2018 07:58

**To:** EJEL

**Subject:** Re: EI 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

Dear Meryl,

Could you please inform me the progress of *EI 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study?*

Its last update was "sent for blind review"

Looking forward to having the update.

Best

Lantip Diat Prasojo

On Mon, Jun 18, 2018 at 4:16 AM, EJEL <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:

Dear Lantip

Your paper has been sent out for review to two volunteer reviewers on our panel. As soon as I get two reviews for the editors, I will let you know.

With thanks  
regards

Meryl  
Journal Administrator, ACPIIL

On Mon, 1 Oct 2018, 03:13 EJEL, <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:  
Dear Lantip

I'm sorry for the delay in replying; you should have received an out-of-office message while I was away.

I have one review for your paper, but for the double blind review process I need two. The second reviewer should have returned the review a few days ago, but as I have not heard from her, I have sent a chaser today. If I do not get a reply fairly quickly, I will try a new reviewer.

With thanks  
regards

Meryl  
Journal Administrator, ACPIIL

**From:** lantip diat parosojoi [mailto:[lantip@uny.ac.id](mailto:lantip@uny.ac.id)]  
**Sent:** 24 September 2018 16:06  
**To:** EJEL  
**Subject:** Re: Progress submission of EL 3615

Dear Meryl,

Is there any progress of my submission. It has been seven month. Kindly respond.

I need the status because the article is required for a Ph.D graduation of one co-author.

Lantip

On Tue, Sep 11, 2018 at 5:45 PM Lantip Diat Prasojo <[lantip@uny.ac.id](mailto:lantip@uny.ac.id)> wrote:  
Meryl,

Kindly inform me if there is any progress with the review.

*El 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study.*

Lantip diat prasojo

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Dear Meryl,

Thank you for your response.  
Looking forward to having the progress.

lantip

Sent from [Mail](#) for Windows 10

**From:** [EJEL](#)

**Sent:** 02 November 2018 2:52

**To:** '[lantip diat prasojo](#)'

**Subject:** RE: EL 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

Hello Lantip

Thankyou very much for your revised paper. I'm sending it back to the editor today, but he may want the reviewers to have a look too, to ensure they are happy with the changes.

With thanks

Regards

Meryl

Journal Administrator, ACPIL

**From:** lantip diat prasojo [mailto:[lantip@uny.ac.id](mailto:lantip@uny.ac.id)]

**Sent:** 15 October 2018 08:34

**To:** EJEL

**Subject:** Re: EL 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

Dear Meryl,

Please find attached the files, the tracked manuscript's revision and respond to reviewers' comments.

Looking forward to having the good news.

lantip

On Mon, Oct 8, 2018 at 4:01 AM EJEL <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:

Dear lantip

Further to your paper submission to EJEL referenced above, the editor has suggested that the paper needs more work, so we would like to ask you for a revision, please. The editor's comments are as follows:

As the reviewers do quite agree: could you please ask the author to revise the documents according to reviewers' comments and resubmit it? Especially, much attention needs to be paid to:

\* the novelty of the findings -> What has to be done?

Are the findings obvious?

\* the study design -> resolve the misconceptions

\* a sound language check by a native English speaker

Please find attached the reviewers' feedback for your paper and their suggestions; Reviewer 2 has also provided an annotated copy of the paper for you.

We would be pleased to re-evaluate your paper if you are able to attend to these issues. To enable our Editor to track the changes you make will you please ensure that you turn on the "**Track changes**" facility when you revise your paper (You will find this under the Review heading in Word).

When you send me your revised paper, please also provide a short descriptive overview of the changes made to your paper on the attached "author response to reviewers" form. This is quite important to us, as this structured form enables us all to ensure that all the points have been dealt with appropriately.

The editor has also requested that you have the paper proof-read by a native English speaker in order to improve the standard of the English. If you are unable to arrange this yourself, you are welcome to contact ACPI, who can provide a proof-reading service for a fee; payment must be made in advance and the contact is [elaine.hayne@academic-conferences.org](mailto:elaine.hayne@academic-conferences.org)

Please acknowledge receipt of this email and confirm that you still wish to proceed, and also please be so kind as to ensure that you quote the above reference number on communications regarding this submission, as omitting it may delay our reply.

Do you think you could send me your revised paper by **31<sup>st</sup> October**, please?

With thanks  
Regards

Meryl Toomey  
Journal Administrator  
ACPIL

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Dear Meryl,

I attached the file after proofreading. Kind regards

Look forward to having the progress.

Lantip

On Mon, Oct 15, 2018 at 3:34 PM lantip diat prasojo <lantip@uny.ac.id> wrote:  
Dear Meryl,

Please find attached the files, the tracked manuscript's revision and respond to reviewers' comments.

Looking forward to having the good news.

Lantip

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On Mon, Dec 10, 2018 at 4:11 AM lantip dait prasojo <lantip@uny.ac.id> wrote:  
Dear Meryl,

Thank you for your response.  
Looking forward to having the result.

Lantip

On Mon, 10 Dec 2018, 00:37 EJEL, <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:  
Dear lantip

One reviewer has responded to say that the paper is OK now, apart from minor punctuation errors.

The second reviewer I know is extremely busy and I've chased him once already, and chased him again today.

If I don't get a response shortly, I will go back to the editor anyway.

I'll let you know the outcome.

With thanks for your patience  
regards

Meryl  
Journal Administrator, ACPII

**From:** lantip diat prasojo [mailto:lantip@uny.ac.id]

**Sent:** 09 December 2018 10:36

**To:** EJEL

**Subject:** Re: EL 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

Dear Meryl,

The co-authors asked me about the progress of our manuscript.  
Kindly inform me if there is any progress.

Lantip

On Mon, Nov 12, 2018 at 5:51 AM lantip diat prasojo <[lantip@uny.ac.id](mailto:lantip@uny.ac.id)> wrote:  
Dear Meryl,

Thank you for your response.

lantip

On Mon, 12 Nov 2018, 04:08 EJEL, <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:  
Hello Lantip

I have to allow the reviewers time to look at the revised paper; they are volunteers who do this for us on top of their normal workload, and are already very busy.  
I would normally allow another week, but I have sent a gentle reminder today.

With thanks  
regards

Meryl  
Journal Administrator, ACPIIL

On Tue, Nov 6, 2018 at 6:24 AM lantip diat prasojo <[lantip@uny.ac.id](mailto:lantip@uny.ac.id)> wrote:  
Many thanks, Meryl.

lantip

On Tue, 6 Nov 2018, 06:03 EJEL, <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:  
Thankyou lantip

I am sending it back to the reviewers now, as the editor requested, to ensure they are happy with the changes.

With thanks  
regards

Meryl  
Journal Administrator, ACPIIL

**From:** lantip diat prasojo [lantip@uny.ac.id]

**Sent:** 03 November 2018 02:08

**To:** EJEL

**Subject:** Re: EL 3615 : Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

Meryl,

I forgot to revise the table.

I email the new revised manuscript (after proofreading) with table as you suggested.

Lantip

On Sat, Nov 3, 2018 at 8:41 AM lantip diat prasojo [lantip@uny.ac.id](mailto:lantip@uny.ac.id) wrote:

Dear Meryl,

I agree with the editor. Therefore, I made changes on the texts; tracked manuscript, proofread manuscript, and author's response (attached). Please let me know, if there is any progress. Hope the manuscript could meet EJEL's expectations

Lantip

On Sat, Nov 3, 2018 at 6:13 AM EJEL <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:  
Dear lantip

The editor does indeed want the reviewers to see the paper, but has made a couple of comments that I thought you should see before I send it to the reviewers.

First, he thinks the title sounds a little odd, and might usefully be rewritten; he says:

Examining Indonesian Principals' Perceptions  
on ICT Integration Barriers through Explanatory  
Sequential Study

I would have changed it into

An Explanatory Sequential Study on Indonesian  
Principals' Perceptions on ICT Integration Barriers

And secondly:

If a "unique selling position" of the article is the research context of a developing country, would it be offensive to ask the authors to point out this specific circumstance to make the argumentation of the article stronger? I appreciate that nobody is happy to label his own country as "developing", but at the moment this fact is included only as tacit knowledge ... and there might be the chance that the findings are not only applicable to Indonesia, but to other countries of the same cultural background, too.

What do you think of these proposals? I think the rearranged title certainly reads better in English, it sounds less stilted.

The second point is at your discretion, but I think the editor is right that it would strengthen the argument, and would be worth pointing out that lessons learned could be applied in other countries at a similar stage of economic development.

Thirdly, the numbers are misaligned in Tables 2 and 3, which suggests the tabs were created manually. It makes the table information more difficult to read, and I'm concerned the numbers might lose their positions further during the typesetting process. Can I suggest you use the Table function (under the INSERT tab in Word) to create table layouts, which will then be delineated, clear, aligned and fixed?

With thanks  
regards

Meryl  
Journal Administrator, ACPIL

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That's great news, thank you.  
Looking forward to having the invoice.

Best wishes.  
lantip

On Thu, 24 Jan 2019, 04:10 EJEL, <[administrator@ejel.org](mailto:administrator@ejel.org)> wrote:  
Dear Lantip

I am pleased to inform you that your paper has now been accepted for publication in the next issue of EJEL.

The editor has made some layout corrections to your revised paper; the copy is attached. Please would you accept the changes, save it as the final document, and let me have it back?

As you will remember from the submission guidelines, in accordance with the practice in the open access community authors are asked to pay a nominal sum to publish in EJEL, which is intended to cover some of the costs of publishing. The publication charge is **GBP 250** (this includes 20%VAT), payable only after the paper has been accepted for publication. There is no charge to access the journal on screen or by printing or downloading the papers.

We will shortly create an invoice which we can send you by email. Please would you advise to whom, or to which institution, the invoice should be made out, the address, and **provide any institutional information** we should quote in order to enable your accounts department to process the invoice (eg. your institution's VAT number). Upon payment the paper will be passed to the typesetter and as soon as she has it ready to publish you will receive a page-proof to check. We will endeavour to publish the paper within two weeks of your acceptance of the page-proof, if possible.

With thanks  
Regards

Meryl Toomey  
Journal Administrator  
ACPI

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## Combined Reviews for Author/s

Comments to be forwarded to the author/s

**Paper Reference:** EL 3615

**Paper Title:** Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

### REVIEWER 1

#### A. Review of Paper

**1. Introduction:** Provides an adequate framing for the paper, and a sufficient overview of the background to the research problem

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
						x			

#### Supporting comments

The introductory part gives a clear overview of the underlying research question. The abstract, however, could be kept more general (e.g. no detailed information on how many items the questionnaire consisted of and how many of the overall number were returned as this information is not relevant at this point).

**2. Research problem:** The research problem is articulated clearly, with an appropriate rationale and justification of its importance.

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
				x					

#### Supporting comments

The research question is clearly stated but doesn't add anything new to academic debate. External and/or internal barriers to successful implementation of ICT/E-Learning/web-based learning etc. have been extensively researched for many years.

**3. Literature Review:** Encompasses a comprehensive and exhaustive coverage of available appropriate and contemporary literature. Furthermore the literature review entails a critical analysis which further expounds the research problem.

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
									x

#### Supporting comments

The literature review is quite good and comprehensive.

[Type text]



**4. Research design and methods:** *The research design is clearly described, with adequate justification for the choice of methods and a clear account of how the evidence has been analysed. In general, acceptable norms of good research practice have been upheld in the conduct of the research.*

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
								x	

**Supporting comments**

The methodology itself is well described and comprehensible for the reader. The overall number of evaluated questionnaires appears sufficient to arrive at some general conclusions.

**5. Findings and discussion:** *The evidence or empirical data presented in the article (where applicable) are adequate. The discussion is detailed, and indicates depth of insight which provides a firm foundation for making a contribution to the body of knowledge.*

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
				x					

**Supporting comments**

cf. comments on research problem/question; conclusions are quite predictable right from the beginning as the barriers to ICT integration in different countries/cultures have been part of research for many years

**6. Contribution of the paper:** *Overall, the paper makes a useful contribution to the promotion and development of new knowledge in the field, and will generally generate further interest and debate.*

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
		x							

**Supporting comments**

As the author/s state themselves (p. 14), the perceived barriers show similarities across time, space and culture.

**7. Conclusions:** *The conclusions demonstrate a firm grasp of the key issues, summarises the salient contributions of the paper, and provide some direction for future work.*

Poor

Excellent

1	2	3	4	5	6	7	8	9	10
				x					

**Supporting comments**

WHAT needs to be done again appears to be quite obvious. It would be more interesting to learn about the HOW to do it (financing, organization, staff ...).

**8. Technical issues: Evaluate the overall technical quality of the paper.**

Poor				Excellent					
1	2	3	4	5	6	7	8	9	10
	x								

**Supporting comments**

- from a language point of view the paper is NOT acceptable (vocabulary, grammar, punctuation, spelling, omissions, partly not acceptable in terms of academic style (e. g. we then held ...)
- numbering of tables inaccurate (there are not 3 but 4 tables!)
- presentation of findings on external barriers on page 8 is repeated on page 9; the discussion of the findings itself basically consists of again stating all of the items which can be read in the table anyway; on the other hand there are no comments on the table of internal barriers on page 10

*If any of the following technical aspects of the paper requires specific improvement, please indicate in the comment column. Leave blank if no improvements are required.*

Technical issue	Comment
Title of paper	
Abstract (300 words)	160 words; see comment above (1)
Language, grammar and spelling	see above (8)
Structure of paper	
In-text citation style	
All citations are included in the reference list	
References and citations are presented in Harvard style	

**9. Additional comment or suggestions**

In addition to the comments above please indicate any other suggestions for the authors to improve the paper.

-

## B. Final Recommendation

I recommend that the paper be (please mark with an X):

Accepted without modification	
Accepted on condition that modifications are effected	
*Revised and re-submitted for further consideration	<b>x</b>
Not accepted	

## REVIEWER 2

### C. Review of Paper

**10. Introduction:** Provides an adequate framing for the paper, and a sufficient overview of the background to the research problem

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
					X				

#### Supporting comments

The introduction is fairly written but some sentences expressing facts need to be cited. I have indicate these sentences/paragraphs on the manuscript

**11. Research problem:** The research problem is articulated clearly, with an appropriate rationale and justification of its importance.

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
					X				

#### Supporting comments

Research problem is well articulated and it well motivates the need for the research

**12. Literature Review:** Encompasses a comprehensive and exhaustive coverage of available appropriate and contemporary literature. Furthermore the literature review entails a critical analysis which further expounds the research problem.

Poor								Excellent	
------	--	--	--	--	--	--	--	-----------	--

[Type text]

1	2	3	4	5	6	7	8	9	10
			X						
<b>Supporting comments</b>									
The section of the literature was mixed with the introduction and such weakened the importance of the study									

**13. Research design and methods:** *The research design is clearly described, with adequate justification for the choice of methods and a clear account of how the evidence has been analysed. In general, acceptable norms of good research practice have been upheld in the conduct of the research.*

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
		X							
<b>Supporting comments</b>									
<p>In the first place, triangulation of methods doesn't necessarily imply mixed methods. This was the first misconception of the study. Secondary using descriptive analysis doesn't necessarily imply the use of quantitative research. In a quantitative research, a research suggest factors like in this case that are perceived as barriers to implementation of technology in schools, the relationship between these factors (Correlation analysis) and go ahead to show the influence of those factors to the dependent variable (regression analysis) and the contribution of each factor to the overall implementation of technology.</p> <p>I however commend the effort taken to interpret the qualitative results though it lacked implications to theory and practice.</p>									

**14. Findings and discussion:** *The evidence or empirical data presented in the article (where applicable) are adequate. The discussion is detailed, and indicates depth of insight which provides a firm foundation for making a contribution to the body of knowledge.*

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
				X					
<b>Supporting comments</b>									
The qualitative findings are well explained though suffered from poor reporting and use of English. As mentioned above the quantitative part is missing and since the data is already collected, the authors may go a step further and analyze the impact of the suggested barriers in order to have a strong and meaningful explanation.									

**15. Contribution of the paper:** *Overall, the paper makes a useful contribution to the promotion and development of new knowledge in the field, and will generally generate further interest and debate.*

# EJEL

The Electronic Journal of e-Learning

[www.ejel.org](http://www.ejel.org)

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Fax +44-(0)118-972-4691

Administrator @ejel.com

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
			X						

### Supporting comments

Not much insights can be drawn from this paper with the exception of the fact that, technology implementation in developing countries is still impended by many factors and a clear analysis of these factors is needed to inform decision making. This was a funded research, I would expect the funders to be eager for better results than what is presented.

**16. Conclusions:** *The conclusions demonstrate a firm grasp of the key issues, summarises the salient contributions of the paper, and provide some direction for future work.*

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
		X							

### Supporting comments

It is difficult to read and draw meaningful insights from the conclusion of this study. I believe the poor use of English also contributed to this.

**17. Technical issues:** *Evaluate the overall technical quality of the paper.*

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10

### Supporting comments

The whole paper need to be language edited and citations revisited

***If any of the following technical aspects of the paper requires specific improvement, please indicate in the comment column. Leave blank if no improvements are required.***

Technical issue	Comment
Title of paper	
Abstract (300 words)	
Language, grammar and spelling	Paper need to be language edited some sentence are difficult to comprehend
Structure of paper	
In-text citation style	Need to be revisited
All citations are included in the reference list	

[Type text]

References and citations are presented in Harvard style	
---	--

## 18. Additional comment or suggestions

In addition to the comments above please indicate any other suggestions for the authors to improve the paper.

I have indicated several comments on the manuscript if followed it will help to improve this paper
--

## D. Final Recommendation

I recommend that the paper be (please mark with an X):

Accepted without modification	
Accepted on condition that modifications are effected	
*Revised and re-submitted for further consideration	X
Not accepted	

## Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

### Abstract

This mixed method\_ explanatory sequential study, investigated Indonesian secondary school principals' perceptions ~~about~~ towards barriers regarding the Information and Communication Technology (ICT) integration in Indonesian secondary schools. For the quantitative phase, we administered a survey instrument that composed of 26 items to 250 secondary school principals in Jambi located in southern part of Sumatra Island, Indonesia. However, only 201 responses were measurable and analysed. The survey instrument was developed based on previous related literatures, validated through content validity, and piloted before being distributed with internal consistency of .79 and 0.80 considered accepted. We then held three Focus Group Discussions (FGDs) to obtain more in-depth information about the barriers experienced by 30 self-motivated respondents joining the FGDs. Each FGD was attended by 10 participants. The findings informed that the most highly identified barriers were teachers' knowledge of ICT, funding for ICT, traditional teaching style. professional development. district culture, school culture. Recommendation are offered for the betterment of technology integration for educational purpose.

*Keywords: Barriers; Indonesia; Techhnoology Integration; Secondary school principals*

### Introduction

In the teaching and learning processes in education, the role of technology is currently transforming to become one of the most important influencing factors. The role has been widely discussed in some current educational policy studies (Anderson, 2010). There are agreements among educational experts that if technology has been properly integrated in instructional activities, it will give great expectation to the improvement of teaching and learning and shaping opportunities of future workforce. Through the history of

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Internal consistency is affected by the inter-correlations of items. It also depends on the number of items you have per construct. Items should not be over correlated or less correlated as too low alpha or too high alpha values are not good

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technology integration in education, technology illiteracy is nowadays considered as the new form of illiteracy (Rosen and Michelle, 1995). This fact has lead policy makers in every country in the world to a new strong intention and effort to equip schools and universities with Information and Communicating Technology (ICT) infrastructures such as computers and internet access as well as qualified staff, teachers and administrators to produce students as future generation who are proficient in technology use for every opportunity they will have in the future. There is no hesitation that computer and internet have been able to aid teaching and learning process as well as have provided proper opportunities to facilitate students' learning. Many studies have informed positive integration effects of technology in instructional processes (e.g. [Ertmer and Ottenbreit-Leftwich, 2010](#); Arntzen and Krug 2011; Deng, Chai, Tsai and Lee, 2014; [Ertmer and Ottenbreit-Leftwich, 2010](#); Kimmons, Miller, Amador, Desjardins and Hall, 2015).

In addition to the positive effects of integration revealed by the studies, any strategy that seeks to change the teaching practice should consider the social and cultural context of the school organization (Hargreaves, Earl, Moore and Manning, 2001; Tondeur, Devos, Van Houtte, van Braak and Valcke, 2009). This means taking into account sociocultural aspects relating to the knowledge, meanings and understanding of the new strategy by the members of a school organization, as well as the changes in social relations it may produce (Cooper, 1988). One common issue when implementing new strategies with ICT is that they tend to focus on adopting the technology, without providing the appropriate conditions for the social and cultural learning that is required for ~~the~~ innovation (Hargreaves, et al., [2001](#)). Among these conditions, a shared view by the school members that are involved is essential. This shared view includes their perceptions of barriers of ICT integration in educational setting (Alghamdi and Prestridge, 2015).

Studies have informed that the external or original first-order barrier of ICT integration, having access to computers and the Internet, has been erased in almost every public school classroom in developed countries (Gray, Thomas and Lewis, 2010). However, in developing countries i.e. Indonesia, the barrier regarding computer and the Internet facility still emerges (Habibi, Mukminin, Riyanto, Prasajo, Sulistiyo, Saudagar and Sofwan, 2018). In addition, some teachers inform that limited access to computers and the Internet is still a main barrier to full ~~ICT~~ integration of ~~ICT~~ (Cuban and Jandric, 2015). Other external barriers are inferior hardware or software; limited administrative, peer, and technical support; a lack of training; and a lack of time to improve skills to use computers and the Internet (Ertmer, Ottenbreit-Leftwich and York, 2007; Kim, Kim, Lee, Spector and DeMeester, 2013; Kilinc, [Tarman, and Aydin, 2018](#); Ogurlu and Sevim 2017; Schul 2017).



[Tarkan, and Aydin, 2018;](#)). Researchers in educational technology have revealed that these barriers will probably always emerge with the changing of technology including the innovation and development and current design of the school system (Hermans, Tondeur, van Braak, and Valcke, 2008; Hsu and Sharma, 2008). Reducing first-order barriers or external barriers require high cost funding, reforming the pre-service models at the university level, and restructuring the systems supporting ICT integration at the district and school levels (Ertmer Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur, 2012; Lim, Zhao, Tondeur, Chai and Tsai, 2013; Machado and Chung, 2015).

Research on ICT in the classroom has found that just providing access to computers will not ensure the use of ICT by teachers and students (Collins and Halverson, 2009). Researchers have found that second-order barriers or internal barriers are more difficult to overcome than that of first-order barriers (Alkhaldeh and Menchaca, 2014; Cui and Vowell, 2013; Ertmer, et al., 2012). The most common second-order barriers include pedagogical beliefs, motivation, established practices and cultures, and personal beliefs about computers ([Ertmer, et al., 2012;](#) Mueller, Wood, Willoughby, Ross and Specht, 2008; [Ertmer, et al., 2012;](#)).

For the administrators e.g school principals, the logic is one of vital things regarding the barriers of ICT integration in schools. The principals are very important to create the conditions required for a school reform to be finally beneficial for ICT integration (Hargreaves, et al., 2001; Korumaz, 2016). Studies inform that principals who have capacities in supporting and guiding their school teachers in technology integration into teaching practice obtain a clear vision of how the technology will contribute to improving projects in shaping the ways students learn in current technological development in education (Chang, 2012). The school principals' involvement in the integration of technology is crucial the program sustainability. Therefore, this current study was conducted to comprehensively understand barriers experienced by secondary school principals regarding technology integration in education. Two guiding questions are:

1. What and how are ICT integration external barriers perceived by Indonesian secondary school principals?
2. What and how are ICT integration internal barriers perceived by Indonesian secondary school principals?

### **Methodology**

This study was a sequential explanatory design of mixed method sponsored by LPDP Indonesia (Indonesian Endowment Fund for Education). This strategy is characterized by the collection and analysis of quantitative data in the first phase of

research, followed by the collection and analysis of qualitative data in the second phase that builds on the results (Brannen, 2005; Creswell 2014). A sequential explanatory strategy was used because this study tends to use quantitative research. Then, to obtain further information about the results, the phase was followed by qualitative research (Brannen, 2005). Researcher in this design typically organizes the report of procedures into quantitative data collection and analysis first, followed by qualitative data collection and analysis. This strategy emphasized how the qualitative findings helped elaborate on or extend the quantitative results (Creswell, 2014). The study began with a survey collection of data and analysis followed by interviewing members of Focus Group Discussion (FGD).

### **Quantitative phase**

We used survey design which provides numeric description using questionnaires for data collection. Survey research aimed to describe the situation and the characteristics of a population (Fraenkel & Wallen, 2009). The population of this study is more than 1000 secondary school principals in Jambi, one of Indonesian provinces. Using sample random sampling, we distributed the survey instrument to 250 principals of the schools where 210 principals returned the survey. However, there were only 201 survey materials were completed and measurable.

The first step in developing the barriers survey was to review relevant literatures instruments ([Serhan, 2007](#), Claro, Nussbaum, López and Contardo, 2017; Avidov-Ungar and Shamir-Inbal, 2017; Kilinc, Tarman and Aydin, 2018; [Serhan, 2007](#)) that were already being used for assessing barriers of technology integration in educational settings. Most of these instruments focused on the constructs of internal and external barriers of principals regarding technology integration. We, all the research group members developed and revised all items in three session of discussion. We then sent the instrument to a panel of experts. The experts were three experts in educational technology and two experts whose major is educational policy and management from Malaysia (Lawshe, 1975). The process, content validity, took almost 1 month to complete. Each expert was requested to rate to what extent each question measured using a 10-point scale (with 1 being to the least measure and 10 being to the greatest measure). The experts were also asked to provide some comments and suggestions for each question and, in some cases, suggested their own possible question list for either internal or external constancy. After being reviewed with the panel of experts, we developed 32 instrument items of the survey. However, six items were eliminated because they were not reliable according to the result of the survey pilot study. These 26 items, participants ~~responded~~ responded each item with a four-level

likert scale: 1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree. The instrument also included items addressing demographic information namely email, gender, age, and experience, as well as educational qualification. We conducted the pilot study where the instrument was distributed to 35 principals.

We collect the data through printed questionnaire. After obtaining the data, we measured the internal instrument consistency reliability. The internal consistency reliability (coefficient alpha) of the two instrument was .79 for internal barriers and .80 for external barriers which According to George and Mallery (2001), the alpha is considered to be acceptable. We assessed each item for internal final consistency using Cronbach's alpha reliability technique. We used descriptive statistics (Ross, 2010) to measure the mean and standard deviation of the research results.

### Qualitative phase

After the analysis of the quantitative phase, we held Focus Group Discussions (FGD) to obtain in-depth information about barriers' in technology integration with 30 school principals from three regions of Jambi province. We use case study approach to understand barrier of technology integration from the perspectives of school principals (Creswell, 2014; Patton, 1990; Merriam, 1998; Creswell, 2014; Patton, 1990). Creswell (2014) argued that a case study is appropriate if the researcher wants to produce a high-quality theory because a single case study explores and creates deeper theories. They also informed that the researcher would have better understanding of the explored object the research. Choosing a qualitative case study approach in this sequential explanatory design was for the reason that the findings of this study might not be generalized to the other places or participants in Indonesia (Creswell, 2014).

During the distribution of the survey instrument in the first phase, we asked the respondents to fill in the availability questions confirming whether they were willing to attend the FGDs. There were surprisingly 57 respondents agreed to participate. However, we chose only 30 participants from three areas in Jambi. The choice was previously discussed regarding the areas representatives, financial matter, and other important factors that was considered convenience sampling. We masked participants' name into symbols (P1-P30) in the data presentation to protect their right as human being (Creswell, 2014). This convenience sampling procedure was considered suitable for a mixed method study (Fraenkel and Wallen, 2009). One week after the discussion, we contacted the chosen participants through phone calls and short messages and asked them to come to the FGD sessions which were held Jambi, the city centre. All costs including

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transportation, accommodation, and consumption were paid using research funding. The FGDs were divided into three sessions, each FGD was attended by 10 participants. The discussion lasted more or less 120 minutes recorded and video-taped. The survey instrument was the set of guiding questions for a semi-structure discussion or interview. Semi-structured questions are applied to comprehend how some interventions work and how they can be improved which allows interviewers to discuss issues that may not be considered. (Creswell, 2014). During the FGDs, the participants were free to argue using *Bahasa Indonesia* but limited to some certain rules introduced in the beginning of each discussion. We used a very supporting room with no intervening sounds from outside because on the transcribing data process, we utilized Google doc. transcriber which needs clear sound to transfer the voice of FGDs into words format.

We analyzed the data by using an across and between analysis (~~Stake, 1995~~; Creswell, 2014; ~~Stake, 1995~~). We processed the data analysis with equal manners although the participants' background and experience varied. The first activity that the researcher did after obtaining the data from focus group discussion is that to transcribe the data. Using a newest invention from Google, the data was processed through Google docs voice typing where we merely attached the voice of the participants with a special tool to connect it into Google docs voice typing and it was automatically typed the sound, a very efficient way of data transcription. The next step was to compile the transcribed voiced to Microsoft office. After computerizing the data, we printed the files in order to examine the data. We read and re-read the transcripts to highlight and examine for connections and redundancies. This activity was guided by one of researchers. The next step is that we coded the transcription manually, and translated the coded data into English while dividing the translated data into themes regarding to the survey result. In relation to the research purposes, we focused on the topic related to the survey instrument and some additional or emerging information in line with barriers of technology integration from the principals' perspectives.

To ensure the trustworthiness (~~Lincoln and Guba, 1985~~) of the study, we included verbatim examples from the transcribed interviews (~~Lincoln and Guba, 1985~~). We also did member checking (Johnson and Christensen, 2008; Creswell, 2014; Habibi, Mukminin, Sofwan and Sulistiyo, 2017). We checked not only with all participants of the FGDs but also with co-researchers serving as member checking. In this step, we returned all data of the FGDs and our findings to all participants in order to get their feedback and agreement. This step was taken for making sure that our data presentation were not bias. Also, we wanted to make sure that the participants agreed with what we found in this study. All

participants of the FGDs informed that they allowed us to use the data for our study. We masked the participants' names and other identities for ethical consideration.

## Findings

Two hundred and one measurable responses were received out of 250 distributed printed questionnaire, of which, male samples almost quadrupled female samples. The largest age group was 40–50 years, accounting for 43.28%. Regarding the educational qualification, most of the participant (62.69%) graduated from postgraduate schools, master levels. Only one of them graduate as doctor of education. Ninety-three participant had experience from 1 to 10 years being a school principal. Merely 7 participants had experience of above 30 years to lead schools. Table 1 shows the detailed sample demographics.

**Table 1: Demographic questionnaire (n. 201)**

*Demographic questionnaire (n. 201)*

Information	Frequency	Percent (%)
<b>Gender</b>		
(1) Male	164	81.59
(2) Female	37	18.41
<b>Age</b>		
(1) Below 30	2	1
(2) 30-40	48	23.88
(3) 40-50	87	43.28
(4) Above 50	64	31.84
<b>Experience as school principals</b>		
(1) 1-10	93	46.27
(2) 11-20	79	39.30
(3) 20-30	22	10.95
(4) Above 30	7	3.48
<b>Educational qualification</b>		
(1) Undergraduate	74	36.82
(2) Master	126	62.69
(3) Doctoral	1	0.48

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**Table**

### Quantitative phase

To explore school Principals' Perceptions on ICT Integration Barriers, we calculated descriptive statistics (frequency, percent, mean, and standard deviation) for each item. In the survey, we included items from a external barrier perspective (Q1–Q14) and a internal perspective (Q16–Q26). Table 2 depicts the frequency and percentage for each answer and the means and standard deviations for each of the 14 indicators of external barriers. Based on the mean scores, principals agreed that professional development courses provided by the authorities were irrelevant to school needs for technology integration ( $m = 3.45$ ), there is inability to provide computers in classroom ( $m = 3.45$ ), there is no support to refresh program for older computers and other devices ( $m = 3.45$ ), there is no support from district authority for ICT needs ( $m = 3.44$ ), the ICT is easily to damage because the school culture is not supportive there is no support from district authority for ICT needs ( $m = 3.41$ ), there is inability to provide Internet in classroom ( $m = 3.41$ ), there is inability to provide Internet in school ( $3.38$ ), there is no sufficient technical support to solve technological problems ( $m = 3.29$ ), and there is inability to provide computers in school ( $3.15$ ).

However, some items seemed to have strong “disagreement” perception: Technology integration spends too much time for teaching ( $m = 15$ ), the school curriculum does not allow much time for technology integration ( $m = 2.00$ ), the condition of classrooms is not suitable for integrating technology ( $m = 1.98$ ), high-stake test restricts the use of technology ( $m = 1.97$ ), and Teachers cannot access softwares that they can utilize for their class ( $m = 1.95$ ). in brief, these results prove that those factors are not barriers of ICT integration perceived by Indonesian secondary schools.

**Table 2: External barriers mean and SD**

*External barriers mean and SD*

Item	Mean	SD
Professional development courses provided by the authorities were irrelevant to school needs for technology integration.	3.45	.53
There is inability to provide computers in classroom	3.45	.60
There is no support to refresh program for older computers and other devices	3.45	.61
There is no support from district authority for ICT	3.44	.61

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needs		
The ICT is easily to damage because the school culture is not supportive	3.41	.60
There is inability to provide Internet in classrooms	3.41	.61
There is inability to provide Internet in school	3.38	.60
There is no sufficient technical support to solve technological problems	3.29	.59
There is inability to provide computers in school	3.15	.80
Technology integration spends too much time for teaching	2.15	.51
The school curriculum does not allow much time for technology integration	2.00	.64
The condition of classrooms is not suitable for integrating technology	1.98	.64
High-stake test restricts the use of technology	1.97	.56
Teachers cannot access softwares that they can utilize for their class	1.95	.60
Cronbach's alpha		.79

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*Internal barriers mean and SD*

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Item	Mean	SD
I think that the teachers in my school lack of knowledge to integrate ICT with pedagogy.	3.78	.44
I think that the teachers in my school lack of knowledge to integrate ICT with content of the course.	3.68	.52
I think that the teachers in my school lack of confidence in using ICT	3.60	.57
I think that the teachers in my school lack of knowledge of ICT use	3.41	.61
The teachers preferred traditional teaching styles than using technology	3.30	.53
Technology integration makes teaching to become more teacher centered.	2.03	.64
I don't believe teachers would know how to effectively integrate technology into teaching process	2.00	.62
Rapid developments of technology makes me worried	1.94	.92
Technology integration make classroom management to become less effective	1.87	.53
Technology integration limits teachers' role in the classroom.	1.86	.66
Technology integration limits student centered learning.	1.83	.67
The integration of technology decreases students' attention and concentration to the lesson.	1.83	.66
Cronbach's alpha		.80

**Qualitative phase**



In the following section, participant data are analyzed and presented as related to the main research questions. We present all 30 participants' responses in the focus group discussions to determine sub-themes. We categorized the sub-themes based on two main themes as previously informed in the quantitative phase\_ external barriers and internal barriers. We established the sub-themes identified by 50% or more of the participants in the FGDs. It was determined that there were four sub-themes for the external barriers and three sub-themes for internal barriers after the establishment (see Table 3).

Table 3

*Themes and sub-themes from FGDs about barriers of ICT integration*

Themes	Sub-themes	<u>Number of</u> participants	<u>Frequency</u> of responses
External barriers	• Lack of funding	30	75
	• Lack of professional development	25	67
	• School culture	23	59
	• District culture	15	35
Internal barriers	• lack of teachers' knowledge of ICT and ICT integration for active learning	29	87
	• lack of teachers' self-efficacy of ICT and ICT integration	29	84
	• Traditional teaching styles	22	74

#### **External barriers**

There are four sub-themes for external barriers which include Lack of funding, Lack of professional development, School culture, District culture.

All participants with 75 frequency of responses in the FGDs **informed indicated** the lack of funding for ICT was one of the barriers to successfully integrating ICT in their school. Participants revealed that schools need to purchase new ICT devices for

educational purposes, connecting the wireless network for the Internet, and replace older ICT devices. The needs should be supported by sufficient funding. Two of the participants stated (*Quoted verbatim*),

“When we want to increase our ICT integration in schools, we need more devices such as computer, projector, and more importantly the Internet. Inter,”  
(P1)

“I would to inform that there are plenty of older device in our schools that need to replace with the new ones. However, we have no enough budget to spend within this need.” (P27)

The second external barrier informed in the FGDs is lack of professional development. More than 83% of the participants had perception that there were significant barriers to integrating ICT in line with the lack of professional development for to teachers to improve their etither their knowledge of ICT skill or ICT integration into teaching. One of the participants informed that although there had been good ICT devices available in the school for teaching and learning processes, there were no sufficient training or workshop to support the ICT integration. Some other participants indicated that plenty of the professional development programs did not have adequate follow-up training, workshop, or practice on how to effectively use ICT for instruction. One of the participants, P12 ~~informed~~ that plenty of the professional development programs offered by either public or private institutions did not support not only teachers to extend the use of ICT during teaching and learning processes and the significant advantages using technology compares to traditional teaching styles, but also principals to manage the administration and do supervision using ICT.

The third external barrier found in this study is school culture. Twenty-three participants perceived that the culture of schools can also be a significant barrier for ICT integration in their school. One participant ~~informed~~ ~~reported~~ that when teachers were informed that there will be new devices regarding technology integration for instructional activities, they would make replied comments such as, “We purchase ICT devices, then the irresponsible students damage them. It is so annoying that the situation might happen in our school”. In addition to the broken devices caused by few student, some school principals believed that school cultures including the way teachers in the classroom are ingrained prevent or hinder ~~ef~~ ICT integration during teaching and learning processes. One of the participants ~~informed~~ ~~noted~~,

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“If the government want to make ICT integration to become a success story. ~~They~~ It ~~needs~~ to establish the school culture that embrace the use of such technologies.” (P15)

Half of the participant (15 principals) with thirty-five responses mentioned that the district culture was also a barrier to technology integrations in this study. Five participants shared in the discussions that the culture of district became one of competitive challenges for limited ICT resources in their school which produced schools that had less ICT than others with different areas of districts. One of the participants, (p6) clearly informed us in the discussion that the head of department in charge for operational staff in his district educational department was a barrier because he neither supported the ICT integration nor purchased ICT devices for the school.

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### Internal Barriers

The internal barriers revealed in our research were lack of teachers’ knowledge of ICT and ~~ICT~~ its integration for active learning, lack of teachers’ self-efficacy of ICT and ~~ICT~~ its integration, and traditional teaching styles (see Table 3). The first internal barrier ~~informed identified by~~ in this study was lack of teachers’ knowledge of ICT and ~~ICT~~ its integration for active learning. All but one of the participants identified teachers’ lack of knowledge of ICT and ~~ICT~~ its integration during teaching and learning processes. One participant (P10) in the discussion stated that the barrier was related to “how proficient the teachers understand about technology in general and how good they integrate ICT into their classroom routines.” Another participant (P13) informed that this lack of knowledge of ICT and ~~ICT~~ its integration as “the most important factor predicting the teachers’ decision to use or not to use the technology in their instructional activities.”

Lack of teachers’ self-efficacy of ICT and ICT integration was another sub-theme revealed from this study. We identified this sub-theme from twenty-nine participants’ opinions in the FGDs. One of the participants (P7) revealed “Self-efficacy of the teachers are significant barrier for ICT integration in our school. I have ever talked to some of them and they informed me that they have lack of confidence teaching with ICT.” Another principal (P2) also informed that not only self-efficacy for ICT integration was of the barrier, but also self-efficacy using the ICT devices as barrier informed in this study.

Twenty-two participants indicated that the traditional teaching style was another barrier to integrating ICT in school they lead. Participants opined that the shift from the teacher-centred teaching class to student-centred learning, providing opportunity for the

integration of ICT to support teaching and learning processes was a barrier. One participant (P28) informed that teachers, especially senior teachers, have had many years of training and practices to conduct instructional activities in a specific way where students just sit there in your little row and always listen to their teachers.

## Discussion

The preliminary findings of study indicated that the most highly identified external barriers were mainly ~~related~~ to lack of funding such as ~~there is~~ inability to provide computers and the Internet in either classrooms or schools, and there is no support to refresh program for older computers and other devices as well as ~~there is no~~ sufficient technical support to solve technological problems. This result is somewhat surprising because Indonesian government ~~have has~~ spent ~~their its/her~~ 20 % of national budgets on educational funding including ~~the spending on cost of~~ ICT ~~spending implementation~~ and supporting (Luschei, 2017; Sofwan and Habibi, 2016; Luschei, 2017; Sofwan and Habibi, 2016). The results agree with some previous related studies in other countries (Kilinc, Tarman and Aydin, 2018; Neville, 2004; Ogurlu and Sevim 2017; Schul 2017), which maintained that teachers perceived a lack of funding to provide computers' software and hardware as well as the Internet as barriers for technology integration. Another study by Wachira and Keengwe (2011) ~~informed note~~ that the Japanese schools found formidable barriers, specifically the absence of a media specialists/ technology technicians which was similar to this study result. Besides, school ~~cultures~~ and district ~~cultures there~~ are also ~~barriers found as other~~ external barriers ~~found by in~~ this study.

Professional development regarding ICT integration into the curriculum for effective and efficient teaching and learning processes is an essential component to promote the use of ICT during instruction (Darling-Hammond, Wei, Andree, Richardson and Orphanos, 2009; Derbel, 2017). However, professional development programs can be in some certain condition perceived as one of significant barriers for ICT integration when the programs are not in relation to actual teaching practices or are merely focused on ICT skill development (Tarman and Chigisheva 2017). Indeed, this study also revealed similar results, the Indonesian school principals informed in the survey and FGDs that the professional development courses that teachers need to attend were not relevant to their needs for integrating ICT and perceived insufficient technology-related professional developments as a main barrier for technology integration. In brief, the conclusion can be informed that the perceived barriers of school principals to ICT integration in instructional activities show similarities across time, space, and culture.

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From the survey and FGDs, it is informed that secondary school principals opined that teachers' lack of knowledge of ICT and ~~ICT its~~ integration, lack of confidence in using ICT integration, and beliefs in traditional teaching styles are external barriers ~~in this study.~~ Teachers' level of ICT skill and confidence are predicting factors and have a significant influence on the quantity of ICT integration used to support teaching and learning processes (~~Alkhaldeh and Menchaca, 2014~~ Cui and Vowell, 2013; ~~Alkhaldeh and Menchaca, 2014~~ Cui and Vowell, 2013). One of important findings study in the US for example informed that the lack of necessary knowledge is an unavoidable barrier to ICT integration in the classroom (Mackenzie 2013).

In contrast to teachers' lack of knowledge and confidence of ICT and ICT integration, traditional teaching styles were revealed as ~~a barriers~~ that ~~was could~~ not as easily ~~be~~ overcome. The thirty secondary school principals who recognized traditional teaching styles as a barrier to ICT integration did not facilitate a recommended solution. This barrier is very complicated and has been rooted in the school teaching cultures in relation to teachers' background education and experiences, and thus it is difficult to overcome (~~Levin and Wadmany, 2008; Tondeur, et al., 2009;~~ Cuban and Jandric, 2015; ~~Levin and Wadmany, 2008; Tondeur, et al., 2009~~). Most principals ~~that participated in the believed in the~~ Focus Group Discussions ~~believe~~, that the traditional teaching style was a lasting barrier for many teachers, particularly veteran teachers. This finding is in alignment with the studies in conjunction with the extreme difficulty in overcoming external barriers (Ertmer, et al., 2008; Kim, et al., 2013; Mueller, 2008).

### Implication

~~This study recommends that.~~ District-level educational authorities ~~are recommended to should~~ provide and develop professional development training programs for principals and teachers to improve effective ICT plans with an emphasis on ICT integration in the schools. This training program is crucial for principals to comprehend and evaluate the significance of applying a collaboration to establish set specific goals regarding ICT integration, setting an appropriate budget plan for ICT purchases and refresh old and slow technological devices, and recognizing all certain and analysed supports the teachers will be required to ICT integration, including balanced professional development opportunities. When ~~principals they~~ are trained, ~~principals they~~ will be able to start the process of revision or development, and finalisation of technology plan with certain effectiveness for the school they ~~leadhead~~.

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Principals should be committed to working in collaboration with schools' staff members to develop a short and long term ICT integration plan. Early steps would be developing the current inventory of technologies, teachers' needs, and annual objectives for computer ratio to student total number. In addition to that, schools should move towards a program of one student-one device. They should plan to utilize and organized computer labs to support academic activities. This plan should be bringing the proposal of funding sources and the potential funding capacity to purchase new technological devices, renew old and slow devices, and support the maintenance of the wireless capacity within their school site. The district's technology department/authorities should be invited to get involved, or at least having them for discussion and consultation when the plan is established and implemented.

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## Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

### Abstract

This mixed method\_ explanatory sequential study, investigated Indonesian secondary school principals' perceptions about towards barriers regarding the Information and Communication Technology (ICT) integration in Indonesian secondary schools. For the quantitative phase, we administered a survey instrument that composed of 26 items to 250 secondary school principals in Jambi located in southern part of Sumatra Island, Indonesia. However, only 201 responses were measurable and analysed. The survey instrument was developed based on previous related literatures, validated through content validity, and piloted before being distributed with internal consistency of .79 and 0.80 considered accepted. We then held three Focus Group Discussions (FGDs) to obtain more in-depth information about the barriers experienced by 30 self-motivated respondents joining the FGDs. Each FGD was attended by 10 participants. The findings informed that the most highly identified barriers were teachers' knowledge of ICT, funding for ICT, traditional teaching style. professional development. district culture, school culture. Recommendation are offered for the betterment of technology integration for educational purpose.

*Keywords: Barriers; Indonesia; Techhnology Integration; Secondary school principals*

### Introduction

In the teaching and learning processes in education, the role of technology is currently transforming to become one of the most important influencing factors. The role has been widely discussed in some current educational policy studies (Anderson, 2010). There are agreements among educational experts that if technology has been properly integrated in instructional activities, it will give great expectation to the improvement of teaching and learning and shaping opportunities of future workforce. Through the history of

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Internal consistency is affected by the inter-correlations of items. It also depends on the number of items you have per construct. Items should not be over correlated or less correlated as too low alpha or too high alpha values are not good

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technology integration in education, technology illiteracy is nowadays considered as the new form of illiteracy (Rosen and Michelle, 1995). This fact has lead policy makers in every country in the world to a new strong intention and effort to equip schools and universities with Information and Communicating Technology (ICT) infrastructures such as computers and internet access as well as qualified staff, teachers and administrators to produce students as future generation who are proficient in technology use for every opportunity they will have in the future. There is no hesitation that computer and internet have been able to aid teaching and learning process as well as have provided proper opportunities to facilitate students' learning. Many studies have informed positive integration effects of technology in instructional processes (e.g. [Ertmer and Ottenbreit-Leftwich, 2010](#); Arntzen and Krug 2011; Deng, Chai, Tsai and Lee, 2014; [Ertmer and Ottenbreit-Leftwich, 2010](#); Kimmons, Miller, Amador, Desjardins and Hall, 2015).

In addition to the positive effects of integration revealed by the studies, any strategy that seeks to change the teaching practice should consider the social and cultural context of the school organization (Hargreaves, Earl, Moore and Manning, 2001; Tondeur, Devos, Van Houtte, van Braak and Valcke, 2009). This means taking into account sociocultural aspects relating to the knowledge, meanings and understanding of the new strategy by the members of a school organization, as well as the changes in social relations it may produce (Cooper, 1988). One common issue when implementing new strategies with ICT is that they tend to focus on adopting the technology, without providing the appropriate conditions for the social and cultural learning that is required for ~~the~~ innovation (Hargreaves, et al., [2001](#)). Among these conditions, a shared view by the school members that are involved is essential. This shared view includes their perceptions of barriers of ICT integration in educational setting (Alghamdi and Prestridge, 2015).

Studies have informed that the external or original first-order barrier of ICT integration, having access to computers and the Internet, has been erased in almost every public school classroom in developed countries (Gray, Thomas and Lewis, 2010). However, in developing countries i.e. Indonesia, the barrier regarding computer and the Internet facility still emerges (Habibi, Mukminin, Riyanto, Prasajo, Sulistiyo, Saudagar and Sofwan, 2018). In addition, some teachers inform that limited access to computers and the Internet is still a main barrier to full ~~ICT~~ integration of ~~ICT~~ (Cuban and Jandric, 2015). Other external barriers are inferior hardware or software; limited administrative, peer, and technical support; a lack of training; and a lack of time to improve skills to use computers and the Internet (Ertmer, Ottenbreit-Leftwich and York, 2007; Kim, Kim, Lee, Spector and DeMeester, 2013; Kilinc, ~~Tarman, and Aydin, 2018~~; Ogurlu and Sevim 2017; Schul 2017).

[Tarkan, and Aydin, 2018;](#)). Researchers in educational technology have revealed that these barriers will probably always emerge with the changing of technology including the innovation and development and current design of the school system (Hermans, Tondeur, van Braak, and Valcke, 2008; Hsu and Sharma, 2008). Reducing first-order barriers or external barriers require high cost funding, reforming the pre-service models at the university level, and restructuring the systems supporting ICT integration at the district and school levels (Ertmer Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur, 2012; Lim, Zhao, Tondeur, Chai and Tsai, 2013; Machado and Chung, 2015).

Research on ICT in the classroom has found that just providing access to computers will not ensure the use of ICT by teachers and students (Collins and Halverson, 2009). Researchers have found that second-order barriers or internal barriers are more difficult to overcome than that of first-order barriers (Alkhaldeh and Menchaca, 2014; Cui and Vowell, 2013; Ertmer, et al., 2012). The most common second-order barriers include pedagogical beliefs, motivation, established practices and cultures, and personal beliefs about computers ([Ertmer, et al., 2012;](#) Mueller, Wood, Willoughby, Ross and Specht, 2008; [Ertmer, et al., 2012;](#)).

For the administrators e.g school principals, the logic is one of vital things regarding the barriers of ICT integration in schools. The principals are very important to create the conditions required for a school reform to be finally beneficial for ICT integration (Hargreaves, et al., 2001; Korumaz, 2016). Studies inform that principals who have capacities in supporting and guiding their school teachers in technology integration into teaching practice obtain a clear vision of how the technology will contribute to improving projects in shaping the ways students learn in current technological development in education (Chang, 2012). The school principals' involvement in the integration of technology is crucial the program sustainability. Therefore, this current study was conducted to comprehensively understand barriers experienced by secondary school principals regarding technology integration in education. Two guiding questions are:

1. What and how are ICT integration external barriers perceived by Indonesian secondary school principals?
2. What and how are ICT integration internal barriers perceived by Indonesian secondary school principals?

### **Methodology**

This study was a sequential explanatory design of mixed method sponsored by LPDP Indonesia (Indonesian Endowment Fund for Education). This strategy is characterized by the collection and analysis of quantitative data in the first phase of

research, followed by the collection and analysis of qualitative data in the second phase that builds on the results (Brannen, 2005; Creswell 2014). A sequential explanatory strategy was used because this study tends to use quantitative research. Then, to obtain further information about the results, the phase was followed by qualitative research (Brannen, 2005). Researcher in this design typically organizes the report of procedures into quantitative data collection and analysis first, followed by qualitative data collection and analysis. This strategy emphasized how the qualitative findings helped elaborate on or extend the quantitative results (Cresswell, 2014). The study began with a survey collection of data and analysis followed by interviewing members of Focus Group Discussion (FGD).

### **Quantitative phase**

We used survey design which provides numeric description using questionnaires for data collection. Survey research aimed to describe the situation and the characteristics of a population (Fraenkel & Wallen, 2009). The population of this study is more than 1000 secondary school principals in Jambi, one of Indonesian provinces. Using sample random sampling, we distributed the survey instrument to 250 principals of the schools where 210 principals returned the survey. However, there were only 201 survey materials were completed and measurable.

The first step in developing the barriers survey was to review relevant literatures instruments ([Serhan, 2007](#), Claro, Nussbaum, López and Contardo, 2017; Avidov-Ungar and Shamir-Inbal, 2017; Kilinc, Tarman and Aydin, 2018; [Serhan, 2007](#)) that were already being used for assessing barriers of technology integration in educational settings. Most of these instruments focused on the constructs of internal and external barriers of principals regarding technology integration. We, all the research group members developed and revised all items in three session of discussion. We then sent the instrument to a panel of experts. The experts were three experts in educational technology and two experts whose major is educational policy and management from Malaysia (Lawshe, 1975). The process, content validity, took almost 1 month to complete. Each expert was requested to rate to what extent each question measured using a 10-point scale (with 1 being to the least measure and 10 being to the greatest measure). The experts were also asked to provide some comments and suggestions for each question and, in some cases, suggested their own possible question list for either internal or external constancy. After being reviewed with the panel of experts, we developed 32 instrument items of the survey. However, six items were eliminated because they were not reliable according to the result of the survey pilot study. These 26 items, participants ~~responded~~ responded each item with a four-level

likert scale: 1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree. The instrument also included items addressing demographic information namely email, gender, age, and experience, as well as educational qualification. We conducted the pilot study where the instrument was distributed to 35 principals.

We collect the data through printed questionnaire. After obtaining the data, we measured the internal instrument consistency reliability. The internal consistency reliability (coefficient alpha) of the two instrument was .79 for internal barriers and .80 for external barriers which According to George and Mallery (2001), the alpha is considered to be acceptable. We assessed each item for internal final consistency using Cronbach's alpha reliability technique. We used descriptive statistics (Ross, 2010) to measure the mean and standard deviation of the research results.

### Qualitative phase

After the analysis of the quantitative phase, we held Focus Group Discussions (FGD) to obtain in-depth information about barriers' in technology integration with 30 school principals from three regions of Jambi province. We use case study approach to understand barrier of technology integration from the perspectives of school principals (Creswell, 2014; Patton, 1990; Merriam, 1998; Creswell, 2014; Patton, 1990). Creswell (2014) argued that a case study is appropriate if the researcher wants to produce a high-quality theory because a single case study explores and creates deeper theories. They also informed that the researcher would have better understanding of the explored object the research. Choosing a qualitative case study approach in this sequential explanatory design was for the reason that the findings of this study might not be generalized to the other places or participants in Indonesia (Creswell, 2014).

During the distribution of the survey instrument in the first phase, we asked the respondents to fill in the availability questions confirming whether they were willing to attend the FGDs. There were surprisingly 57 respondents agreed to participate. However, we chose only 30 participants from three areas in Jambi. The choice was previously discussed regarding the areas representatives, financial matter, and other important factors that was considered convenience sampling. We masked participants' name into symbols (P1-P30) in the data presentation to protect their right as human being (Creswell, 2014). This convenience sampling procedure was considered suitable for a mixed method study (Fraenkel and Wallen, 2009). One week after the discussion, we contacted the chosen participants through phone calls and short messages and asked them to come to the FGD sessions which were held Jambi, the city centre. All costs including

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transportation, accommodation, and consumption were paid using research funding. The FGDs were divided into three sessions, each FGD was attended by 10 participants. The discussion lasted more or less 120 minutes recorded and video-taped. The survey instrument was the set of guiding questions for a semi-structure discussion or interview. Semi-structured questions are applied to comprehend how some interventions work and how they can be improved which allows interviewers to discuss issues that may not be considered. (Creswell, 2014). During the FGDs, the participants were free to argue using *Bahasa Indonesia* but limited to some certain rules introduced in the beginning of each discussion. We used a very supporting room with no intervening sounds from outside because on the transcribing data process, we utilized Google doc. transcriber which needs clear sound to transfer the voice of FGDs into words format.

We analyzed the data by using an across and between analysis ([Stake, 1995](#); Creswell, 2014; ~~Stake, 1995~~). We processed the data analysis with equal manners although the participants' background and experience varied. The first activity that the researcher did after obtaining the data from focus group discussion is that to transcribe the data. Using a newest invention from Google, the data was processed through Google docs voice typing where we merely attached the voice of the participants with a special tool to connect it into Google docs voice typing and it was automatically typed the sound, a very efficient way of data transcription. The next step was to compile the transcribed voiced to Microsoft office. After computerizing the data, we printed the files in order to examine the data. We read and re-read the transcripts to highlight and examine for connections and redundancies. This activity was guided by one of researchers. The next step is that we coded the transcription manually, and translated the coded data into English while dividing the translated data into themes regarding to the survey result. In relation to the research purposes, we focused on the topic related to the survey instrument and some additional or emerging information in line with barriers of technology integration from the principals' perspectives.

To ensure the trustworthiness (~~Lincoln and Guba, 1985~~) of the study, we included verbatim examples from the transcribed interviews ([Lincoln and Guba, 1985](#)). We also did member checking (Johnson and Christensen, 2008; Creswell, 2014; Habibi, Mukminin, Sofwan and Sulistiyo, 2017). We checked not only with all participants of the FGDs but also with co-researchers serving as member checking. In this step, we returned all data of the FGDs and our findings to all participants in order to get their feedback and agreement. This step was taken for making sure that our data presentation were not bias. Also, we wanted to make sure that the participants agreed with what we found in this study. All



participants of the FGDs informed that they allowed us to use the data for our study. We masked the participants' names and other identities for ethical consideration.

## Findings

Two hundred and one measurable responses were received out of 250 distributed printed questionnaire, of which, male samples almost quadrupled female samples. The largest age group was 40–50 years, accounting for 43.28%. Regarding the educational qualification, most of the participant (62.69%) graduated from postgraduate schools, master levels. Only one of them graduate as doctor of education. Ninety-three participant had experience from 1 to 10 years being a school principal. Merely 7 participants had experience of above 30 years to lead schools. Table 1 shows the detailed sample demographics.

**Table 1: Demographic questionnaire (n. 201)**

*Demographic questionnaire (n. 201)*

Information	Frequency	Percent (%)
<b>Gender</b>		
(1) Male	164	81.59
(2) Female	37	18.41
<b>Age</b>		
(1) Below 30	2	1
(2) 30-40	48	23.88
(3) 40-50	87	43.28
(4) Above 50	64	31.84
<b>Experience as school principals</b>		
(1) 1-10	93	46.27
(2) 11-20	79	39.30
(3) 20-30	22	10.95
(4) Above 30	7	3.48
<b>Educational qualification</b>		
(1) Undergraduate	74	36.82
(2) Master	126	62.69
(3) Doctoral	1	0.48

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**Table**

### Quantitative phase

To explore school Principals' Perceptions on ICT Integration Barriers, we calculated descriptive statistics (frequency, percent, mean, and standard deviation) for each item. In the survey, we included items from a external barrier perspective (Q1–Q14) and a internal perspective (Q16–Q26). Table 2 depicts the frequency and percentage for each answer and the means and standard deviations for each of the 14 indicators of external barriers. Based on the mean scores, principals agreed that professional development courses provided by the authorities were irrelevant to school needs for technology integration ( $m = 3.45$ ), there is inability to provide computers in classroom ( $m = 3.45$ ), there is no support to refresh program for older computers and other devices ( $m = 3.45$ ), there is no support from district authority for ICT needs ( $m = 3.44$ ), the ICT is easily to damage because the school culture is not supportive there is no support from district authority for ICT needs ( $m = 3.41$ ), there is inability to provide Internet in classroom ( $m = 3.41$ ), there is inability to provide Internet in school ( $3.38$ ), there is no sufficient technical support to solve technological problems ( $m = 3.29$ ), and there is inability to provide computers in school ( $3.15$ ).

However, some items seemed to have strong “disagreement” perception: Technology integration spends too much time for teaching ( $m = 15$ ), the school curriculum does not allow much time for technology integration ( $m = 2.00$ ), the condition of classrooms is not suitable for integrating technology ( $m = 1.98$ ), high-stake test restricts the use of technology ( $m = 1.97$ ), and Teachers cannot access softwares that they can utilize for their class ( $m = 1.95$ ). in brief, these results prove that those factors are not barriers of ICT integration perceived by Indonesian secondary schools.

**Table 2: External barriers mean and SD**

*External barriers mean and SD*

Item	Mean	SD
Professional development courses provided by the authorities were irrelevant to school needs for technology integration.	3.45	.53
There is inability to provide computers in classroom	3.45	.60
There is no support to refresh program for older computers and other devices	3.45	.61
There is no support from district authority for ICT	3.44	.61

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needs		
The ICT is easily to damage because the school culture is not supportive	3.41	.60
There is inability to provide Internet in classrooms	3.41	.61
There is inability to provide Internet in school	3.38	.60
There is no sufficient technical support to solve technological problems	3.29	.59
There is inability to provide computers in school	3.15	.80
Technology integration spends too much time for teaching	2.15	.51
The school curriculum does not allow much time for technology integration	2.00	.64
The condition of classrooms is not suitable for integrating technology	1.98	.64
High-stake test restricts the use of technology	1.97	.56
Teachers cannot access softwares that they can utilize for their class	1.95	.60
Cronbach's alpha		.79

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*Internal barriers mean and SD*

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Item	Mean	SD
I think that the teachers in my school lack of knowledge to integrate ICT with pedagogy.	3.78	.44
I think that the teachers in my school lack of knowledge to integrate ICT with content of the course.	3.68	.52
I think that the teachers in my school lack of confidence in using ICT	3.60	.57
I think that the teachers in my school lack of knowledge of ICT use	3.41	.61
The teachers preferred traditional teaching styles than using technology	3.30	.53
Technology integration makes teaching to become more teacher centered.	2.03	.64
I don't believe teachers would know how to effectively integrate technology into teaching process	2.00	.62
Rapid developments of technology makes me worried	1.94	.92
Technology integration make classroom management to become less effective	1.87	.53
Technology integration limits teachers' role in the classroom.	1.86	.66
Technology integration limits student centered learning.	1.83	.67
The integration of technology decreases students' attention and concentration to the lesson.	1.83	.66
Cronbach's alpha		.80

**Qualitative phase**

In the following section, participant data are analyzed and presented as related to the main research questions. We present all 30 participants' responses in the focus group discussions to determine sub-themes. We categorized the sub-themes based on two main themes as previously informed in the quantitative phase\_ external barriers and internal barriers. We established the sub-themes identified by 50% or more of the participants in the FGDs. It was determined that there were four sub-themes for the external barriers and three sub-themes for internal barriers after the establishment (see Table 3).

Table 3

*Themes and sub-themes from FGDs about barriers of ICT integration*

Themes	Sub-themes	Number of participants	Frequency of responses
External barriers	• Lack of funding	30	75
	• Lack of professional development	25	67
	• School culture	23	59
	• District culture	15	35
Internal barriers	• lack of teachers' knowledge of ICT and ICT integration for active learning	29	87
	• lack of teachers' self-efficacy of ICT and ICT integration	29	84
	• Traditional teaching styles	22	74

#### **External barriers**

There are four sub-themes for external barriers which include Lack of funding, Lack of professional development, School culture, District culture.

All participants with 75 frequency of responses in the FGDs **informed indicated** the lack of funding for ICT was one of the barriers to successfully integrating ICT in their school. Participants revealed that schools need to purchase new ICT devices for

educational purposes, connecting the wireless network for the Internet, and replace older ICT devices. The needs should be supported by sufficient funding. Two of the participants stated (*Quoted verbatim*),

“When we want to increase our ICT integration in schools, we need more devices such as computer, projector, and more importantly the Internet. Inter,”  
(P1)

“I would to inform that there are plenty of older device in our schools that need to replace with the new ones. However, we have no enough budget to spend within this need.” (P27)

The second external barrier informed in the FGDs is lack of professional development. More than 83% of the participants had perception that there were significant barriers to integrating ICT in line with the lack of professional development for to teachers to improve their etither their knowledge of ICT skill or ICT integration into teaching. One of the participants informed that although there had been good ICT devices available in the school for teaching and learning processes, there were no sufficient training or workshop to support the ICT integration. Some other participants indicated that plenty of the professional development programs did not have adequate follow-up training, workshop, or practice on how to effectively use ICT for instruction. One of the participants, P12 ~~informed~~ that plenty of the professional development programs offered by either public or private institutions did not support not only teachers to extend the use of ICT during teaching and learning processes and the significant advantages using technology compares to traditional teaching styles, but also principals to manage the administration and do supervision using ICT.

The third external barrier found in this study is school culture. Twenty-three participants perceived that the culture of schools can also be a significant barrier for ICT integration in their school. One participant ~~informed~~ ~~reported~~ that when teachers were informed that there will be new devices regarding technology integration for instructional activities, they would make replied comments such as, “We purchase ICT devices, then the irresponsible students damage them. It is so annoying that the situation might happen in our school”. In addition to the broken devices caused by few student, some school principals believed that school cultures including the way teachers in the classroom are ingrained prevent or hinder ~~ef~~ ICT integration during teaching and learning processes. One of the participants ~~informed~~ noted,

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“If the government want to make ICT integration to become a success story. ~~They~~ It ~~needs~~ to establish the school culture that embrace the use of such technologies.” (P15)

Half of the participant (15 principals) with thirty-five responses mentioned that the district culture was also a barrier to technology integrations in this study. Five participants shared in the discussions that the culture of district became one of competitive challenges for limited ICT resources in their school which produced schools that had less ICT than others with different areas of districts. One of the participants, (p6) clearly informed us in the discussion that the head of department in charge for operational staff in his district educational department was a barrier because he neither supported the ICT integration nor purchased ICT devices for the school.

**Commented [BMK7]:** This study was about technology integration

**Commented [BMK8]:** Consider using ‘schools’ so that it doesn’t seem that this district officer was specific to one school

### Internal Barriers

The internal barriers revealed in our research were lack of teachers’ knowledge of ICT and ~~ICT~~ its integration for active learning, lack of teachers’ self-efficacy of ICT and ~~ICT~~ its integration, and traditional teaching styles (see Table 3). The first internal barrier ~~informed identified by~~ in this study was lack of teachers’ knowledge of ICT and ~~ICT~~ its integration for active learning. All but one of the participants identified teachers’ lack of knowledge of ICT and ~~ICT~~ its integration during teaching and learning processes. One participant (P10) in the discussion stated that the barrier was related to “how proficient the teachers understand about technology in general and how good they integrate ICT into their classroom routines.” Another participant (P13) informed that this lack of knowledge of ICT and ~~ICT~~ its integration as “the most important factor predicting the teachers’ decision to use or not to use the technology in their instructional activities.”

Lack of teachers’ self-efficacy of ICT and ICT integration was another sub-theme revealed from this study. We identified this sub-theme from twenty-nine participants’ opinions in the FGDs. One of the participants (P7) revealed “Self-efficacy of the teachers are significant barrier for ICT integration in our school. I have ever talked to some of them and they informed me that they have lack of confidence teaching with ICT.” Another principal (P2) also informed that not only self-efficacy for ICT integration was of the barrier, but also self-efficacy using the ICT devices as barrier informed in this study.

Twenty-two participants indicated that the traditional teaching style was another barrier to integrating ICT in school they lead. Participants opined that the shift from the teacher-centred teaching class to student-centred learning, providing opportunity for the

integration of ICT to support teaching and learning processes was a barrier. One participant (P28) informed that teachers, especially senior teachers, have had many years of training and practices to conduct instructional activities in a specific way where students just sit there in your little row and always listen to their teachers.

## Discussion

The preliminary findings of study indicated that the most highly identified external barriers were mainly ~~related~~ to lack of funding such as ~~there is~~ inability to provide computers and the Internet in either classrooms or schools, and there is no support to refresh program for older computers and other devices as well as ~~there is no~~ sufficient technical support to solve technological problems. This result is somewhat surprising because Indonesian government ~~have has~~ spent ~~their its/her~~ 20 % of national budgets on educational funding including ~~the spending on~~ cost of ICT ~~spending~~ implementation and supporting (Luschei, 2017; Sofwan and Habibi, 2016; Luschei, 2017; Sofwan and Habibi, 2016). The results agree with some previous related studies in other countries (Kilinc, Tarman and Aydin, 2018; Neville, 2004; Ogurlu and Sevim 2017; Schul 2017), which maintained that teachers perceived a lack of funding to provide computers' software and hardware as well as the Internet as barriers for technology integration. Another study by Wachira and Keengwe (2011) ~~informed note~~ that the Japanese schools found formidable barriers, specifically the absence of a media specialists/ technology technicians which was similar to this study result. Besides, school ~~cultures~~ and district ~~cultures there~~ are also ~~barriers found as~~ other external barriers ~~found by in~~ this study.

Professional development regarding ICT integration into the curriculum for effective and efficient teaching and learning processes is an essential component to promote the use of ICT during instruction (Darling-Hammond, Wei, Andree, Richardson and Orphanos, 2009; Derbel, 2017). However, professional development programs can be in some certain condition perceived as one of significant barriers for ICT integration when the programs are not in relation to actual teaching practices or are merely focused on ICT skill development (Tarman and Chigisheva 2017). Indeed, this study also revealed similar results, the Indonesian school principals informed in the survey and FGDs that the professional development courses that teachers need to attend were not relevant to their needs for integrating ICT and perceived insufficient technology-related professional developments as a main barrier for technology integration. In brief, the conclusion can be informed that the perceived barriers of school principals to ICT integration in instructional activities show similarities across time, space, and culture.

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From the survey and FGDs, it is informed that secondary school principals opined that teachers' lack of knowledge of ICT and ~~ICT its~~ integration, lack of confidence in using ICT integration, and beliefs in traditional teaching styles are external barriers ~~in this study.~~ Teachers' level of ICT skill and confidence are predicting factors and have a significant influence on the quantity of ICT integration used to support teaching and learning processes (~~Alkhaldeh and Menchaca, 2014~~ Cui and Vowell, 2013; ~~Alkhaldeh and Menchaca, 2014~~ Cui and Vowell, 2013). One of important findings study in the US for example informed that the lack of necessary knowledge is an unavoidable barrier to ICT integration in the classroom (Mackenzie 2013).

In contrast to teachers' lack of knowledge and confidence of ICT and ICT integration, traditional teaching styles were revealed as ~~a barriers~~ that ~~was could~~ not as easily ~~be~~ overcome. The thirty secondary school principals who recognized traditional teaching styles as a barrier to ICT integration did not facilitate a recommended solution. This barrier is very complicated and has been rooted in the school teaching cultures in relation to teachers' background education and experiences, and thus it is difficult to overcome (~~Levin and Wadmany, 2008; Tondeur, et al., 2009;~~ Cuban and Jandric, 2015; ~~Levin and Wadmany, 2008; Tondeur, et al., 2009~~). Most principals ~~that participated in the believed in the~~ Focus Group Discussions ~~believe~~, that the traditional teaching style was a lasting barrier for many teachers, particularly veteran teachers. This finding is in alignment with the studies in conjunction with the extreme difficulty in overcoming external barriers (Ertmer, et al., 2008; Kim, et al., 2013; Mueller, 2008).

### Implication

~~This study recommends that.~~ District-level educational authorities ~~are recommended to should~~ provide and develop professional development training programs for principals and teachers to improve effective ICT plans with an emphasis on ICT integration in the schools. This training program is crucial for principals to comprehend and evaluate the significance of applying a collaboration to establish set specific goals regarding ICT integration, setting an appropriate budget plan for ICT purchases and refresh old and slow technological devices, and recognizing all certain and analysed supports the teachers will be required to ICT integration, including balanced professional development opportunities. When ~~principals they~~ are trained, ~~principals they~~ will be able to start the process of revision or development, and finalisation of technology plan with certain effectiveness for the school they ~~leadhead~~.

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Principals should be committed to working in collaboration with schools' staff members to develop a short and long term ICT integration plan. Early steps would be developing the current inventory of technologies, teachers' needs, and annual objectives for computer ratio to student total number. In addition to that, schools should move towards a program of one student-one device. They should plan to utilize and organized computer labs to support academic activities. This plan should be bringing the proposal of funding sources and the potential funding capacity to purchase new technological devices, renew old and slow devices, and support the maintenance of the wireless capacity within their school site. The district's technology department/authorities should be invited to get involved, or at least having them for discussion and consultation when the plan is established and implemented.

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## Author/s Response to Reviewer

**Paper Ref:**

**Paper Title:**

**Date:**

Please cut and paste each review comment into a separate row. Add extra rows as necessary.

Reviewer 1	
	Describe briefly your response to the reviewer's comment, and describe what change, if any, you have made to the manuscript.
1. The introductory part gives a clear overview of the underlying research question. The some detailed information as suggested, however, could be kept more general (e.g. no detailed information on how many items the questionnaire consisted of and how many of the overall number were returned as this information is not relevant at this point).	The abstract has been revised. We eliminated of abstract,
2. The research question is clearly stated but doesn't add anything new to academic debate. External and/or internal barriers to successful implementation of ICT/E-Learning/web-based learning etc. have been extensively researched for many years.	The questions have been extensively researched for many years. However, the topic is still a new issue in developing countries. Even, not many studies were conducted from the perspectives of school administrators in developing countries like Indonesia. The study is expected to be an insightful reference for countries with similar characteristics.
3. The literature review is quite good and comprehensive.	The part was improved in some parts for the betterment of the article.
4. The methodology itself is well described and comprehensible for the reader. The overall number of evaluated questionnaires appears sufficient to arrive at some general conclusions.	We made improvement in this section
5. comments on research problem/question; conclusions are quite predictable right from the beginning as the barriers to ICT integration in different countries/cultures have been part of	The argument is appropriate; however, not many studies revealed school administrators' perception in developing countries. research for many years
6. As the author/s state themselves (p. 14), the perceived barriers show similarities across	

time, space and culture.	
7. WHAT needs to be done again appears to be quite obvious. It would be more interesting to learn about the HOW to do it (financing, organization, staff ...).	Some information regarding financing, organization, and staff has been included.
<ul style="list-style-type: none"> <li>8. from a language point of view the paper is NOT acceptable (vocabulary, grammar, punctuation, spelling, omissions, partly not acceptable in terms of academic style (e. g. <u>we</u> then held ...)</li> <li>numbering of tables inaccurate (there are not 3 but 4 tables!)</li> <li>presentation of findings on external barriers on page 8 is repeated on page 9; the discussion of the findings itself basically consists of again stating all of the items which can be read in the table anyway; on the other hand there are no comments on the table of internal barriers on page 10</li> </ul>	<p>Revised thoroughly</p> <p>The inaccuracy has been revised</p> <p>All suggestion has been review</p> <p>The manuscript was revised accordingly</p>
9.	
10.	

<b>Reviewer 2</b>	Describe briefly your response to the reviewer's comment, and describe what change, if any, you have made to the manuscript.
1. The introduction is fairly written but some sentences expressing facts need to be cited. I have indicate these sentences/paragraphs on the manuscript	The citations have been included
2. Research problem is well articulated and it well motivates the need for the research	-
3. The section of the literature was mixed with the introduction and such weakened the importance of the study	The sections, Introduction and literature have been separated as it suggested
4. In the first place, triangulation of methods doesn't necessarily imply mixed methods. This	Thank you for the review; however, to my knowledge, the descriptive statistics can also



<p>was the first misconception of the study. be categorized as quantitative study</p> <p>Secondary using descriptive analysis doesn't necessarily imply the use of quantitative research. In a quantitative research, a research suggest factors like in this case that are perceived as barriers to implementation of technology in schools, the relationship between these factors (Correlation analysis) and go ahead to show the influence of those factors to the dependent variable (regression analysis) and the contribution of each factor to the overall implementation of technology.</p> <p>I however commend the effort taken to interpret the qualitative results though it lacked implications to theory and practice.</p>	
<p>5. The qualitative findings are well explained Revised as suggested though suffered from poor reporting and use of English. As mentioned above the quantitative part is missing and since the data is already collected, the authors may go a step further and analyze the impact of the suggested barriers in order to have a strong and meaningful explanation.</p>	
<p>6. Not much insights can be drawn from this Some revision is applied paper with the exception of the fact that, technology implementation in developing countries is still impended by many factors and a clear analysis of these factors is needed to inform decision making. This was a funded research, I would expect the funders to be eager for better results than what is presented.</p>	
<p>7. It is difficult to read and draw meaningful The use of English has been proofread and insights from the conclusion of this study. I revised believe the poor use of English also contributed to this.</p>	
<p>8. The whole paper need to be language edited and citations revisited</p>	<p>The manuscript has been through the process, proof reading.</p>

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9.	
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**Other comments for the reviewers and the editorial team:**

We focus on secondary school principals' perceptions on ICT integration in Indonesia, a developing country which makes this research different and unique compared to previous literatures.

It is expected that the research might be not only beneficial to Indonesia, but also to other countries with similar background.

Please email this form and the revised paper, and your revised paper to [administrator@ejel.org](mailto:administrator@ejel.org)

## An Explanatory Sequential Study on Indonesian Principals' Perceptions on ICT Integration Barriers

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### Examining Indonesian Principals' Perceptions on ICT Integration Barriers through Explanatory Sequential Study

Lantip Diat Prasajo  
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Septu Haswindy  
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### **Abstract**

This ~~mixed method~~ explanatory sequential study, investigated ~~Indonesian~~ secondary school principals' perceptions ~~about towards~~ barriers regarding the Information and Communication Technology (ICT) integration in ~~a developing country~~, Indonesia ~~in secondary schools~~. For the quantitative phase, we administered a survey instrument ~~that composed of 26 items~~ to 250 ~~Indonesian~~ secondary school principals ~~in Jambi located in southern part of Sumatra Island, Indonesia~~. However, ~~only 201 responses were measurable and analysed~~. The survey instrument was developed based on previous related literatures, validated through content validity, and piloted before being distributed ~~with internal consistency of .79 and 0.80 considered accepted~~. ~~Following the quantitative process, We then held~~ three Focus Group Discussions (FGDs) ~~with 30 participants were conducted~~ to obtain more in-depth information ~~about the barriers experienced by 30 self-motivated respondents joining the FGDs~~. Each FGD was attended by 10 participants. The findings informed that the most highly identified barriers were teachers' knowledge of ICT, funding for ICT, traditional teaching style. professional

#### **Commented [BMK1]:**

Internal consistency is affected by the inter-correlations of items. It also depends on the number of items you have per construct. Items should not be over correlated or less correlated as too low alpha or too high alpha values are not good

development. district culture, school culture. Recommendation are offered for the betterment of technology integration for educational purpose.

*Keywords: Barriers; Indonesia; Techhology Integration; Secondary school principals; Developing Country*

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## Introduction

In ~~instruction the teaching and learning processes in education~~, the role of technology is currently transforming to become one of the most important influencing factors. The role has been widely discussed in some current educational policy studies (Anderson, 2010; Charbonneau-Gowdy, 2018; Nortvig, Petersen, and Balle, 2018). ~~There are agreements among educational experts that if~~ If technology has been properly integrated in instructional activities, it will give great expectation to the improvement of teaching and learning and shaping opportunities of future workforce (Mishra and Koehler, 2006). Through the history of technology integration ~~in education~~, technology illiteracy is nowadays considered as the new form of illiteracy (Rosen and Michelle, 1995). This fact has lead policy makers in every country in the world to gain a new strong intention and effort to equip schools and universities with Information and Communicating Technology (ICT) infrastructures such as computers and internet access as well as qualified staff, teachers and administrators to produce quality students as future generation who are proficient in technology use for every opportunity ~~they will have~~ in the future. There is no hesitation that computer and internet have been able to aid teaching and learning process as well as have provided proper opportunities to facilitate students' learning. Many studies have informed positive integration effects of technology in instructional processes (e.g. Ertmer and Ottenbreit-Leftwich, 2010; Arntzen and Krug 2011; Deng, Chai, Tsai and Lee, 2014; ~~Ertmer and Ottenbreit-Leftwich, 2010~~; Kimmons, Miller, Amador, Desjardins and Hall, 2015).

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In addition to the positive effects of integration ~~revealed by the studies~~, barrier should also be considered and any strategy that seeks to change the teaching practice should consider the social and cultural context of the school organization (Hargreaves, Earl, Moore and Manning, 2001; Tondeur, Devos, Van Houtte, van Braak and Valcke, 2009). ~~This means taking into account sociocultural aspects relating to the knowledge, meanings and understanding of the new strategy by the members of a school organization, as well~~

as the changes in social relations it may produce (Cooper, 1988). One common issue when implementing new strategies with ICT is that the stakeholders they tend to focus on adopting the technology, without providing the appropriate conditions for the social and cultural learning that is required for the innovation (Hargreaves, et al., 2001). Among these conditions, a shared view by the school members that are involved is essential including school administrators or principals. This shared view includes their perceptions towards barriers of ICT integration in educational setting (Alghamdi and Prestridge, 2015).

For school administrators, the logic is one of vital things regarding the barriers of ICT integration in schools. The principals are very important to create the conditions required for a school reform to be finally beneficial for ICT integration (Hargreaves, et al., 2001; Korumaz, 2016). Studies inform that principals who have capacities in supporting and guiding their school teachers in technology integration into teaching practice obtain a clear vision of how the technology will contribute to improving projects in shaping the ways students learn in current technological development in education (Chang, 2012). The school principals' involvement in the integration of technology is crucial the programme sustainability. Fewer studies were conducted to elaborate school principals' perception towards ICT integration (Kilinc, Ogurlu and Sevim 2017). Even fewer were done in developing countries. Therefore, this current study was conducted to comprehensively understand barriers experienced by secondary school principals regarding technology integration in education in Indonesia as one of the developing countries. The two guiding questions are:

1. What and how are ICT integration external barriers perceived by Indonesian secondary school principals?
2. What and how are ICT integration internal barriers perceived by Indonesian secondary school principals?

## Literature Review

### Barriers of ICT integration

Challenges towards ICT integration have been inspiring educational researchers to cover and overcome the barriers to produce successful ICT integration into teaching (Ertmer, 1999). Barriers to ICT integration was defined as conditions which provide difficulties to well-going process of ICT integration in educational setting (Ertmer, 1999; Bingimlas, 2009; Koh et al., 2013; Tsai & Chai, 2012). Researchers have discussed barriers in ICT integration differently across condition and

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setting; however, two underlined classifications consistently were categorized; external barriers (resources and institutions) and internal barriers (teachers and their attitudes). At early studies, Ertmer (1999) informed these barriers with terms first, order and second-order to ICT integration. They discussed first- and second-order barriers (Ertmer, 1999) as a comparison to evaluate teachers' integration of ICT in an elementary school. While researchers hypothesized that the barriers interact in various ways (Bingimlas, 2009; Koh et al., 2013), there have been no evidence which barriers are the most influential in ICT integration into instruction.

### External barriers of ICT integration

Studies have informed that the external or original first-order barrier of ICT integration, having access to computers and the internet, has been erased in almost every public school classroom in developed countries (Gray, Thomas and Lewis, 2010). However, in developing countries i.e. Indonesia, the barrier regarding computer and the internet facility still emerges (Habibi, Mukminin, Riyanto, Prasajo, Sulistiyo, Saudagar and Sofwan, 2018). In addition, some teachers inform that limited access to computers and the internet is still a main barrier to full ICT integration of ICT (Cuban and Jandric, 2015). Other external barriers are inferior hardware or software; limited administrative, peer, and technical support; a lack of training; and a lack of time to improve skills to use computers and the Internet (Ertmer, Ottenbreit-Leftwich and York, 2007; Kim, Kim, Lee, Spector and DeMeester, 2013; Kilinc, Tarman, and Aydin, 2018; Ogurlu and Sevim 2017; Schul 2017; Tarman, and Aydin, 2018:). Researchers in educational technology have revealed that these barriers will probably always emerge with the changing of technology including the innovation and development as well as current design of the school system (Hermans, Tondeur, van Braak, and Valcke, 2008; Hsu and Sharma, 2008). Reducing first-order barriers or external barriers requires high cost of funding, reforming the pre-service teacher training models reforming in university at the university level, and restructuring the ICT integration systems restructuring in district levels supporting ICT integration at the district and school levels (Ertmer Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur, 2012; Lim, Zhao, Tondeur, Chai and Tsai, 2013; Machado and Chung, 2015).

### Internal barriers

In addition to external barriers, Research on ICT in the classroom has found that just providing access to computers will not ensure the use of ICT by teachers and students (Collins and Halverson, 2009). Researchers have found that second-order barriers or internal barriers are more difficult to overcome than that of first-order barriers

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(Alkhalwaleh and Menchaca, 2014; [Collins and Halverson, 2009](#); Cui and Vowell, 2013; Ertmer, et al., 2012). When teachers as practitioners in the teaching and learning process found many external or first-order barriers, personal or second-order barriers were begun to emerge (Alkhalwaleh and Menchaca, 2014; Ertmer, et al., 2012). Even those who have had positive attitudes towards ICT integration would eventually had negative attitudes towards ICT integration because of the first-order barriers they found (Collins and Halverson, 2009). The most common second-order barriers include pedagogical beliefs, motivation, established practices and cultures, and personal beliefs about computers ([Ertmer, et al., 2012](#); [Ertmer, et al., 2012](#); Mueller, Wood, Willoughby, Ross and Specht, 2008; [Ertmer, et al., 2012](#)).

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~~For the administrators e.g school principals, the logic is one of vital things regarding the barriers of ICT integration in schools. The principals are very important to create the conditions required for a school reform to be finally beneficial for ICT integration (Hargreaves, et al., 2001; Korumaz, 2016). Studies inform that principals who have capacities in supporting and guiding their school teachers in technology integration into teaching practice obtain a clear vision of how the technology will contribute to improving projects in shaping the ways students learn in current technological development in education (Chang, 2012). The school principals' involvement in the integration of technology is crucial the program/programme sustainability. Therefore, this current study was conducted to comprehensively understand barriers experienced by secondary school principals regarding technology integration in education. Two guiding questions are:~~

- ~~1. What and how are ICT integration external barriers perceived by Indonesian secondary school principals?~~
- ~~2. What and how are ICT integration internal barriers perceived by Indonesian secondary school principals?~~

## Methodology

This study was a sequential explanatory design ~~of mixed method sponsored by LPDP Indonesia (Indonesian Endowment Fund for Education). This strategy is~~ characterized by the collection and analysis of quantitative data in the first phase of ~~the~~ research, followed by the collection and analysis of qualitative data in the second phase ~~that builds on the results~~ (Brannen, 2005; Creswell 2014). A sequential explanatory strategy was used because this study tends to use quantitative research. ~~Then, t~~~~I~~o obtain further information about the results, the phase was followed by qualitative research.

(Brannen, 2005). ~~Researcher in this design typically organizes the report of procedures into quantitative data collection and analysis first, followed by qualitative data collection and analysis.~~ This strategy emphasized how the qualitative findings helped elaborate on or extend the quantitative results (Crosswell, 2014).

~~This study was financially supported by the Indonesian ministry of higher education, technology and research which took almost one-year time to complete. The authors are from three universities of two countries and one research institution, Universitas Negeri Yogyakarta, Jambi University, and Jambi Agency of Research and Development (Indonesia) and Universiti Utara Malaysia (Malaysia). The study began with a survey collection of data and analysis followed by interviewing members of Focus Group Discussion (FGD).~~

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### Quantitative phase

We used survey design which provides numeric description using questionnaires for data collection. Survey research aimed to describe the situation and the characteristics of a population (Fraenkel & Wallen, 2009). The population of this study ~~was~~ more than 1000 secondary school principals in Jambi, one of Indonesian provinces in one Indonesian. Using sample random sampling, we distributed the survey instrument to 250 principals of the schools where; however, only 210 principals returned the survey. However, there were only 204 Two hundred and one survey materials were completed and measurable.

The first step in developing the barriers survey was to review relevant literatures instruments (Avidov-Ungar and Shamir-Inbal, 2017; Serhan, 2007; Claro, Nussbaum, López and Contardo, 2017; Avidov-Ungar and Shamir-Inbal, 2017; Kilinc, Tarman and Aydin, 2018; Serhan, 2007; Serhan, 2007) that were already being used for assessing barriers of technology integration in educational settings. Most of these instruments focused on the constructs of internal and external barriers of principals regarding technology integration. We, aAll authors the research group members contributed in developinged and revisingrevised all items in three sessions of discussion. Following the discussion, We then sent the instrument was sent to a panel of experts; -The experts were three experts in educational technology and two experts whose major is educational policy and management as part of content validity processfrom Malaysia (Lawshe, 1975). The process, content validity, took almost 1 month to complete. Each expert was requested to rate to what extent each question measured using a 10-point scale (with 1 being to the least measure and 10 being to the greatest measure). The experts were also asked to



provide some comments and suggestions for each question and, in some cases, suggested their own possible question list for either internal or external constancy.

After being reviewed ~~by~~with the panel of experts, ~~we developed 32 thirty-two items were instrument items of the survey set.~~ However, six items were eliminated because they were not reliable ~~after being piloted with 35 principals according to the result of the survey pilot study.~~ These 26 items, ~~participants responded~~ ~~responded~~ ~~were measured~~ ~~each item~~ ~~with~~ a four-level likert scale: 1. Strongly disagree 2. Disagree 3. Agree 4 . Strongly agree. ~~In addition to the main instruments, The instrument also included items addressing demographic information namely email, gender, age, and experience, as well as educational qualification was also distributed. We conducted the pilot study where the instrument was distributed to 35 principals.~~

~~We~~ collected the data through printed questionnaire. After obtaining the data, we measured the ~~internal instrument consistency reliability or coefficient alpha. The internal consistency reliability (coefficient alpha) of the two instrument was .~~ (.79 for internal barriers and .860 for external barriers). ~~which~~ According to George and Mallery (2001), the alpha is considered to be acceptable. ~~We assessed each item for internal final consistency using Cronbach's alpha reliability technique.~~ We used descriptive statistics (Ross, 2010) ~~measuring to measure~~ the mean and standard deviation of the research ~~for the data elaboration results.~~

### Qualitative phase

After the analysis of the quantitative ~~dataphase, we held FF~~ Focus Group Discussions (FGD) ~~were conducted~~ to obtain in-depth information ~~about regarding~~ barriers' in ~~technology|CT~~ integration ~~with 30 school principals from three regions of Jambi province using .~~ We use a case study approach to understand barrier of technology integration ~~from the perspectives of school principals~~ (Creswell, 2014; ~~Creswell, 2014~~ Patton, 1990; ~~Me~~Merriam, 1998; ~~Creswell, 2014~~ Patton, 1990). Creswell (2014) argued that a case study is appropriate if the researcher wants to produce a high-quality theory because a single case study explores and creates deeper theories. They also informed that the researcher would have better understanding of the explored object the research. Choosing a qualitative case study approach in this sequential explanatory design was for the reason that the findings of this study might not be generalized to the other places or participants ~~in Indonesia~~ (Creswell, 2014).

During the distribution of the survey instrument ~~in the first phase~~, we asked the respondents to fill in ~~an the~~ availability ~~questions form~~ confirming whether they were willing

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to attend the FGDs. There were ~~surprisingly~~ 57 respondents agreed to participate. However, ~~we chose~~ only 30 participants ~~were chosen from three areas in Jambi~~. The choice was previously discussed regarding the ~~areas~~ representative ~~areas~~, financial matter, and other important factors: ~~convenience sampling (Fraenkel and Wallen, 2009), that was considered convenience sampling. W~~We masked participants' name into symbols (P1-P30) in the data presentation to protect their right as human being (Creswell, 2014). ~~This convenience sampling procedure was considered suitable for a mixed method study (Fraenkel and Wallen, 2009). One week after the discussion, w~~The ~~chosene~~ ~~contacted the chosen~~ participants ~~were contacted~~ through phone calls and short messages and asked ~~them to~~ come to the FGD sessions ~~which were held Jambi, the city centre~~. All costs including transportation, accommodation, and consumption were paid ~~by the authors~~ using ~~the~~ research funding. The FGDs were divided into three sessions, each FGD was attended by 10 participants. The discussions ~~lasted for about more or less~~ 120 minutes recorded and video-taped. The survey instrument was the set of guiding questions for ~~thea~~ semi-structure discussion or interview. Semi-structured questions are applied to comprehend how some interventions work and how they can be improved which allows interviewers to discuss issues that may not be considered. (Creswell, 2014). During the FGDs, the participants were free to argue ~~using Bahasa Indonesia~~ but limited to some certain rules introduced ~~in the beginning of the each~~ discussion. We used a very supporting room with no intervening sounds from outside because on the transcribing data process, ~~we utilized Google doc. Transcriber was applied which needs clear sound in the transcribing processto transfer the voice of FGDs into words format.~~

We analyzed the data by using an across and between analysis (Stake, 1995; Creswell, 2014; Stake, 1995). We processed the data analysis with equal manners although the participants' background and experience varied. The first activity that the researcher~~s~~ did after obtaining the data from focus group discussion is that to transcribe the data. Using a newest invention from Google, the data was processed through Google docs voice typing ~~where we merely attached the voice of the participants with a special tool to connect it into Google docs voice typing and it was automatically typed the sound, a very efficient way of data transcription.~~ The next step was to compile the transcribed voiced to Microsoft office. After computerizing the data, we printed the files in order to examine the data. We read and re-read the transcripts to highlight and examine for connections and redundancies. This activity was guided by one of ~~the~~ researchers. ~~The next step is that we coded the transcriptionThe coding was manually done followed by the translation process which resulted on themes and sub-themes, and translated the coded~~

~~data into English while dividing the translated data into themes regarding to the survey result. In relation to the research purposes, we focused on the topic in accordance with the survey results; related to the survey instrument and some additional or emerging information in line with the barriers of technology/ICT integration from the principals' perspectives.~~

To ensure the trustworthiness (Lincoln and Guba, 1985) of the study, we included verbatim examples from the transcribed interviews (Lincoln and Guba, 1985). We also did member checking (Johnson and Christensen, 2008; Creswell, 2014; Habibi, Mukminin, Sofwan and Sulistiyo, 2017). We checked not only with all participants of the FGDs but also with co-researchers serving as member checking. In this step, we returned all data of the FGDs and our findings to all participants in order to get their feedback and agreement. This step was taken to convince for making sure that our data presentation were not bias. Also, we wanted to make sure that the participants agreed with what we found in this study. All participants of the FGDs informed that they allowed us to use the data for our study. We masked the participants' names and other identities for ethical consideration.

## Findings

Two hundred and one measurable responses were received out of 250 distributed printed questionnaire, of which, male samples almost quadrupled female samples. The largest age group was 40–50 years, accounting for 43.28%. Regarding the educational qualification, most of the participant (62.69%) graduated from postgraduate schools, master levels. Only one of them was graduate as doctor of education. Ninety-three participants had experience from 1 to 10 years becoming a school principal. Merely 7 participants had experience of above 30 years to lead schools. Table 1 shows the detailed sample demographics.

**Table 1:**

**Demographic questionnaire (n. 201)**

*Demographic questionnaire (n. 201)*

Information	Frequency	Percent (%)
Gender		
(1) Male	164	81.59
(2) Female	37	18.41

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## Age

(1) Below 30	2	1
(2) 30-40	48	23.88
(3) 40-50	87	43.28
(4) Above 50	64	31.84

## Experience as school principals

(1) 1-10	93	46.27
(2) 11-20	79	39.30
(3) 20-30	22	10.95
(4) Above 30	7	3.48

## Educational qualification

(1) Undergraduate	74	36.82
(2) Master	126	62.69
(3) Doctoral	1	0.48

### Quantitative phase

To explore school Principals' Perceptions on ICT Integration Barriers, we calculated descriptive statistics (frequency, percent, mean, and standard deviation) for each item. In the survey, we included items from an external barrier perspective (Q1–Q14) and an internal perspective (Q16–Q26). Table 2 depicts the frequency and percentage for each answer and the means and standard deviations for each of the 14 indicators of external barriers. Based on the mean scores, principals agreed in most statements, for example, that "professional development courses provided by the authorities were irrelevant to school needs for technology integration", there is (m = 3.45), there is inability to provide computers in classroom", and there is (m = 3.45), there is no support to refresh program/programme for older computers and other devices, (m = 3.45), there is no support from district authority for ICT needs (m = 3.44), the ICT is easily to damage because the school culture is not supportive there is no support from district authority for ICT needs (m = 3.41), there is inability to provide Internet in classroom (m = 3.41), there is inability to provide Internet in school (3.38), there is no sufficient technical support to solve technological problems (m = 3.29), and there is inability to provide computers in school (3.15).

However, some items seemed to have strong "disagreement" perception on some items such as: "Technology integration spends too much time for teaching" (m = 1.5), "the school curriculum does not allow much time for technology integration" (m = 2.00), and "the

condition of classrooms is not suitable for integrating technology" (m=1.98), high-stake test restricts the use of technology (m= 1.97), and Teachers cannot access softwares that they can utilize for their class (m1.95). in brief, these results prove that those factors are not barriers of ICT integration perceived by Indonesian secondary schools.

**Table 2**

**External barriers mean and SD**

*External barriers mean and SD*

Item	Mean	SD
Professional development courses provided by the authorities were irrelevant to school needs for technology integration.	3.45	.53
There is inability to provide computers in classroom	3.45	.60
There is no support to refresh <del>program</del> <u>programme</u> for older computers and other devices	3.45	.61
There is no support from district authority for ICT needs	3.44	.61
The ICT is easily to damage because the school culture is not supportive	3.41	.60
There is inability to provide Internet in classrooms	3.41	.61
There is inability to provide Internet in school	3.38	.60
There is no sufficient technical support to solve technological problems	3.29	.59
There is inability to provide computers in school	3.15	.80
Technology integration spends too much time for teaching	2.15	.51
The school curriculum does not allow much time for technology integration	2.00	.64
The condition of classrooms is not suitable for integrating technology	1.98	.64
High-stake test restricts the use of technology	1.97	.56
Teachers cannot access softwares that they can utilize for their class	1.95	.60

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Cronbach's alpha

.79

For the internal barriers (see Table 3), five statements were positively perceived by the respondents: "I think that the teachers in my school lack of knowledge to integrate ICT with pedagogy", "I think that the teachers in my school lack of knowledge to integrate ICT with content of the course", "I think that the teachers in my school lack of confidence in using ICT", "I think that the teachers in my school lack of confidence in using ICT", and "I think that the teachers in my school lack of knowledge of ICT use". On the other hand, more than seven statement were negatively perceived, for example, "The integration of technology decreases students' attention and concentration to the lesson", "Technology integration limits teachers' role in the classroom", and "Technology integration makes teaching to become more teacher centered".

**To explore school Principals' Perceptions on ICT Integration Barriers,** we calculated descriptive statistics (frequency, percent, mean, and standard deviation) for each item. In the survey, we included items from a external barrier perspective (Q1–Q14) and a internal perspective (Q16–Q26). Table 2 depicts the frequency and percentage for each answer and the means and standard deviations for each of the 14 indicators of external barriers. Based on the mean scores, principals agreed that professional development courses provided by the authorities were irrelevant to school needs for technology integration (m = 3.45), there is inability to provide computers in classroom (m = 3.45), there is no support to refresh program programme for older computers and other devices (m = 3.45), there is no support from district authority for ICT needs (m = 3.44), the ICT is easily to damage because the school culture is not supportive there is no support from district authority for ICT needs (m = 3.41), there is inability to provide Internet in classroom (m=3.41), there is inability to provide Internet in school (3.38), there is no sufficient technical support to solve technological problems (m= 3.29), and there is inability to provide computers in school (3.15).

However, some items seemed to have strong "disagreement" perception: Technology integration spends too much time for teaching (m= 1.5), the school curriculum does not allow much time for technology integration (m= 2.00), the condition of classrooms is not suitable for integrating technology (m=1.98), high-stake test restricts the use of technology (m= 1.97), and Teachers cannot access softwares that they can

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~~utilize for their class (m1.95). in brief, these results prove that those factors are not barriers of ICT integration perceived by Indonesian secondary schools.~~

**Table 32**

**Internal barriers mean and SD**

Item	Mean	SD
I think that the teachers in my school lack of knowledge to integrate ICT with pedagogy-	3.78	.44
I think that the teachers in my school lack of knowledge to integrate ICT with content of the course-	3.68	.52
I think that the teachers in my school lack of confidence in using ICT	3.60	.57
I think that the teachers in my school lack of knowledge of ICT use	3.41	.61
The teachers preferred traditional teaching styles than using technology	3.30	.53
Technology integration makes teaching to become more teacher centered.	2.03	.64
I don't believe teachers would know how to effectively integrate technology into teaching process	2.00	.62
Rapid developments of technology makes me worried	1.94	.92
Technology integration make classroom management to become less effective	1.87	.53
Technology integration limits teachers' role in the classroom.	1.86	.66
Technology integration limits student centered learning.	1.83	.67
The integration of technology decreases students' attention and concentration to the lesson.	1.83	.66
Cronbach's alpha		.86 $\theta$

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**Qualitative phase**

~~In the following section, participant data are analyzed and presented as related to the main research questions. We present all 30 participants' responses in the focus group discussions to determine the sub-themes of the study. We categorized the sub-themes based on two main themes as previously informed in the quantitative phase—external barriers and internal barriers. We established the sub-themes identified by 50% or more of the participants in the FGDs. It was determined that there were four sub-themes for the external barriers and three sub-themes for internal barriers after the establishment emerged from this study (see Table 3).~~

Table 43

*Themes and sub-themes from FGDs about barriers of ICT integration*

Themes	Sub-themes	Number of participants	Frequency of responses
External barriers	• Lack of funding	30	75
	• Lack of professional development	25	67
	• School culture	23	59
	• District culture	15	35
Internal barriers	• lack of teachers' knowledge of ICT and <del>its</del> ICT integration for active learning	29	87
	• lack of teachers' self-efficacy of ICT and <del>its</del> ICT integration	29	84
	• Traditional teaching styles	22	74

### **External barriers**

There are four sub-themes for external barriers which include Lack of funding, Lack of professional development, School culture, District culture.

~~All participants with 75 frequency of responses in the FGDs informed indicated that the lack of funding for ICT was one of the barriers to successfully integrating ICT in their school. Participants revealed that schools need to purchase new ICT devices for educational purposes, ~~connect~~ connecting the wireless network for the Internet, and~~

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replace older ICT devices. The needs should be supported by sufficient funding. Two of the participants stated *(Quoted verbatim)*,

“When we want to increase our ICT integration in schools, we need more devices such as computer, projector, and more importantly the Internet. Inter,”  
(P1)

“I would to inform that there are plenty of older device in our schools that need to replace with the new ones. However, we have no enough budget to spend within this need.” (P27)

The second external barrier informed in the FGDs is lack of professional development. More than 83% of the participants had perception that there were significant barriers to integrating ICT in line with the lack of professional development ~~for te for~~ teachers to improve ~~their-ether~~ both their knowledge of ICT skill ~~er and~~ ICT integration into teaching. One of the participants informed that although there had been good ICT devices available in the school for teaching and learning processes, there were no sufficient training or workshop to support the ICT integration performance. ~~Some-ether~~ Another participants indicated that ~~plenty-of~~ the many ICT-based professional development ~~programprogrammes~~ did not have adequate follow-up trainings, workshops, or field practices on how to effectively use ICT for instruction. ~~One of the participants~~, P12 informed noted that ~~plenty-of many~~ the professional development ~~programprogrammes~~ offered by either public or private institutions did not support not only teachers to extend the use of ICT during teaching and learning processes and the significant advantages using technology compares to traditional teaching styles, but also principals to manage the administration and do supervision in relation to ICT integration in education ~~using~~ ICT.

The third external barrier found in this study is school culture. Twenty-three participants perceived that the culture of schools can also be a significant barrier for ICT integration in their school. One participant ~~informed~~ reported that when teachers were informed that there ~~would~~ will be new ICT devices ~~regarding technology integration~~ for instructional activities, they ~~would make~~ made ~~replied~~ comments such as, “We purchase ICT devices, then the irresponsible students damage them. It is so annoying that the situation might happen in our school”. In addition to the broken devices caused by few student, some school principals believed that school cultures including the way teachers in the classroom are ingrained, prevent or hinder ~~of~~ ICT integration during teaching and learning processes. One of the participants ~~informed~~ noted,

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“If the government want to make ICT integration to become a success story. ~~They~~ It ~~needs~~ to establish the school culture that embrace the use of such technologies.” (P15)

Half of the participant (15 principals) with thirty-five responses mentioned that the district culture was also a barrier to technology integrations in this study. Five participants shared in the discussions that the culture of district became one of the competitive challenges for limited ICT resources in their school ~~which produced schools that had less ICT than others with different areas of districts~~. One of the participants, (P6) ~~clearly~~ informed ~~us in the discussion~~ that the head of the department in charge for operational stuff in his district ~~educational department~~ was a barrier because he neither supported the ICT integration nor purchased ICT devices for the school in his district.

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### Internal Barriers

The internal barriers revealed in this qualitative phase our ~~research~~ were lack of teachers’ knowledge of ICT and ~~ICT its~~ integration for active learning, lack of teachers’ self-efficacy of ICT and ~~ICT its~~ integration, and traditional teaching styles (see Table 43). The first internal barrier ~~informed identified by in this study~~ was lack of teachers’ knowledge of ICT and ~~ICT its~~ integration for active learning perceived by- most participants in the FGDs ~~All but one of the participants identified teachers’ lack of knowledge of ICT and ICT its integration during teaching and learning processes~~. One participant (P10) ~~reported in the discussion stated~~ that the barrier was related to “how proficient the teachers understand about technology in general and how good they integrate ICT into their classroom routines.” Another participant (P13) informed that this lack of knowledge of ICT and ~~ICT its~~ integration as “the most important factor predicting the teachers’ decision to use or not to use ICT the technology in their instructional activities.”

Lack of teachers’ self-efficacy of ICT and ICT integration was another sub-theme revealed from ~~this study~~ the qualitative analysis. We identified ~~this~~ is sub-theme from twenty-nine participants’ opinions in the FGDs. One of the participants (P7) revealed “Self-efficacy of the teachers are significant barrier for ICT integration in myour school. I have ever talked to some of them and they informed me that they have lack of confidence teaching with ICT.” Another principal (P2) also ~~informed~~ that ~~not only~~ self-efficacy for ICT integration was not of the only barrier, but also self-efficacy using the ICT devices as barrier informed in this study.

Twenty-two participants indicated that the traditional teaching style was another barrier to ~~integrating~~ ICT ~~integration~~ in ~~the~~ school they lead. Participants opined that the ~~uneasy~~ shift from the teacher-centred teaching class to student-centred learning ~~was a barrier.~~, ~~providing opportunity for the integration of ICT to support teaching and learning processes was a barrier.~~ One participant (P28) informed that teachers, especially senior teachers, have had many years of training and practices to conduct instructional activities in a specific way where students just ~~sit there in your little row and always~~ listen to their ~~lecture with no innovation in the teaching and learning processes~~ ~~teachers.~~

### Discussion

The preliminary findings of ~~this~~ study indicated that the most highly identified external barriers were mainly ~~realted~~ ~~related~~ to lack of funding such as ~~there is~~ inability to provide computers and the Internet in ~~either~~ classrooms ~~or schools,~~ and ~~there is~~ no support to refresh ~~program~~ ~~programme~~ for older computers and other devices as well as ~~no there is no~~ sufficient technical supports ~~to solve the~~ technological problems. This result is somewhat surprising because Indonesian government ~~have has~~ spent ~~their~~ ~~its/her~~ 20 % ~~of~~ national budgets on educational funding including ~~the spending on~~ ~~cost of~~ ICT ~~spending~~ ~~implementation~~ and ~~its~~ supporting (Luschei, 2017; Sofwan and Habibi, 2016; Luschei, 2017; Sofwan and Habibi, 2016). The results agree with some previous related studies in other ~~developing~~ countries (Kilinc, Tarman and Aydin, 2018; Neville, 2004; Ogurlu and Sevim 2017; Schul 2017), which maintained that teachers perceived a lack of funding to provide computers' software and hardware as well as ~~the~~ Internet as barriers for technology integration. Another study by Wachira and Keengwe (2011) ~~informed~~ ~~reported~~ ~~note~~ that the Japanese schools found formidable barriers, specifically the absence of a media specialists/ technology technicians ~~which was~~ similar to this study result. ~~Besides, school cultures and district cultures there are also barriers found as other~~ ~~external barriers found by in this study.~~

Professional development regarding ICT integration ~~into the curriculum~~ for effective and efficient teaching and learning processes is an essential component to promote the use of ICT during instruction (Darling-Hammond, Wei, Andree, Richardson and Orphanos, 2009; Derbel, 2017). However, professional development ~~program~~ ~~programme~~ can be in some ~~certain~~ condition perceived as one of ~~the~~ significant barriers for ICT integration when the ~~program~~ ~~programme~~s are not in relation to actual teaching practices or ~~are~~ merely ~~focused on~~ ICT skill development (Tarman and Chigisheva 2017). ~~Indeed,~~ ~~†~~ This study also revealed similar results, the Indonesian school principals informed ~~in the survey and~~

FGDs that the professional development courses that teachers need to attend were not relevant to their needs for integrating ICT. ~~They and~~ perceived insufficient technology-related professional developments as ~~one of the main barriers for technology integration.~~ In brief, the conclusion can be informed that the perceived barriers of school principals to ICT integration in instructional activities show similarities across time, space, and culture.

Commented [BMK9]: Rephrase the sentence

From the survey and FGDs, it is informed that ~~the participants of this study~~ secondary school principals opined that teachers' lack of knowledge of ICT and ~~ICT~~ its integration, lack of confidence in using ICT integration, and beliefs in traditional teaching styles are ~~the external barriers for ICT integration in this study.~~ Teachers' level of ICT skill and confidence are predicting factors and have a significant influence on the quantity of ICT integration used to support teaching and learning processes (Alkhaldeh and Menchaca, 2014; Cui and Vowell, 2013; Alkhaldeh and Menchaca, 2014; Cui and Vowell, 2013). One of ~~the significant~~ important findings ~~study in the US for example~~ informed that the lack of necessary knowledge is an unavoidable barrier to ICT integration ~~in the classroom in education~~ (Mackenzie 2013).

Commented [BMK10]: Rephrase

In ~~addition~~ contrast to teachers' lack of knowledge and confidence of ICT and ~~its~~ ICT integration, traditional teaching styles were ~~also~~ revealed as ~~a a~~ barriers that ~~was could~~ not ~~as~~ easily ~~be~~ overcome. ~~The thirty secondary school principals who recognized traditional teaching styles as a barrier to ICT integration did not facilitate a recommended solution.~~ This barrier is very complicated and has been rooted in the school teaching cultures in relation to teachers' background education and experiences, and thus it is difficult to overcome (Levin and Wadmany, 2008; Tondour, et al., 2009; Cuban and Jandric, 2015; Levin and Wadmany, 2008; Tondour, et al., 2009). Most principals ~~that participated in the FGDs believed in the~~ ~~believed in the Focus Group Discussions believe,~~ that the traditional teaching style was a lasting barrier for many teachers, particularly veteran teachers. This finding is in alignment with the ~~previous studies in conjunction with the extreme difficulty in overcoming external barriers~~ (Ertmer, et al., 2008; Kim, et al., 2013; Mueller, 2008).

### Implication

~~This study recommends that,~~ District-level educational authorities ~~are recommended to~~ should provide and develop professional development training ~~program~~ programmes for principals and teachers to improve effective ICT plans with an emphasis on ICT integration in the schools. This training ~~program~~ programme is crucial for principals to comprehend and evaluate the significance of applying a collaboration to establish set specific goals regarding ICT integration, setting an appropriate budget plan

for ICT purchases ~~and refreshes of and refresh old and slow~~ technological devices, and recognizing ~~all certain and analysed~~ supports ~~for~~ the teachers ~~will be required to ICT integration, as well as~~ including balanced professional development opportunities. When ~~principals they~~ are trained, ~~principals they~~ will be able to start the process of ~~the~~ revision or development, and finalisation of technology plan with certain effectiveness for the school ~~they leadhead~~.

Principals should be committed to working in collaboration with schools' staff members to develop a short and long term ICT integration plan. Early steps would be developing the current inventory of ~~teach~~ technologies, teachers' needs, and annual objectives for computer ratio ~~forte students total number~~. In addition to that, schools should move towards a ~~program programme~~ of one student for ~~for~~ one device. They should plan to utilize and organize ~~ed~~ computer labs to support academic activities. This plan should ~~include be bringing~~ the proposal of funding sources and the potential funding capacity to purchase new technological devices, renew old and slow devices, and support the maintenance of the wireless capacity within their school site~~s~~. The district's technology department/authorities should be invited to get involved, or at least having them for discussion and consultation when the plan is established and implemented.

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## An Explanatory Sequential Study on Indonesian Principals' Perceptions on ICT Integration Barriers

### Abstract

This explanatory sequential study investigated secondary school principals' perceptions on barriers regarding the Information and Communication Technology (ICT) integration in a developing country, Indonesia. For the quantitative phase, we administered a survey instrument to 250 Indonesian secondary school principals. The survey instrument was developed based on previous related literature validated through content validity and piloted before being distributed. Following the quantitative process, three Focus Group Discussions (FGDs) with 30 participants were conducted to obtain more in-depth information. Each FGD was attended by 10 participants. The findings revealed that the most highly identified barriers ~~were~~ are teachers' knowledge of ICT, funding for ICT, traditional teaching style, professional development, as well as district ~~culture~~ and school culture. Recommendations are offered for the improvement of technology integration for educational purpose.

**Keywords:** barriers, ~~Indonesia~~, technology ~~integration~~, secondary school principals, developing ~~country~~

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### Introduction

In teaching, the role of technology is currently transforming ~~to~~ and is becoming one of the most important influential factors. The role has been widely discussed in some current educational policy studies (Anderson, 2010; Charbonneau-Gowdy, 2018; Nortvig, Petersen, and Balle, 2018). If technology ~~has had~~ been properly integrated in instructional activities, it ~~will~~ would have led to lead great expectation in the improvement of teaching and learning, and shaping opportunities for future workforce (Mishra and Koehler, 2006). Through the history of technology integration, technology illiteracy is now considered as

the new form of illiteracy (Rosen and Michelle, 1995). This fact has lead policy makers in every country in the world to gain a new strong intention and effort to equip schools and universities with Information and Communicating Technology (ICT) infrastructures such as computers and internet access as well as providing qualified staff, teachers and administrators to produce quality students as the next generation who are proficient in technology use for every opportunity in the future. There is no dispute that computers and internet use have been able to aid the teaching and learning process as well as to provide proper opportunities to facilitate students' learning. Many studies have underlined positive integration effects of technology in instructional processes (e.g. Ertmer and Ottenbreit-Leftwich, 2010; Deng, [Chai, Tsai and Lee et al.](#), 2014; Kimmons, [Miller, Amador, Desjardins and Hallet et al.](#), 2015).

In addition to the positive effects of integration, breaking down barrier should also be considered and any strategy that seeks to change teaching practice should consider the social and cultural context of the school organization (Hargreaves, [et al. Earl, Moore and Manning](#), 2001; Tondeur, [et al., Devos, Van Houtte, van Braak and Valeke](#), 2009). One common issue when implementing new strategies with ICT is that the stakeholders tend to focus on adopting the technology, without providing the appropriate conditions for the social and cultural learning that is required for such an innovation (Hargreaves, et al., 2001). Among these circumstances, all school members who are involved should adopt a common approach, including school administrators or principals. This common approach includes their perception towards barriers of ICT integration in an educational setting (Alghamdi and Prestridge, 2015).

For school administrators , the logical approach is one of the most vital things regarding barriers of ICT integration in schools. The principals are very important in creating the conditions required for a school reform to be finally beneficial for ICT integration (Hargreaves, et al., 2001; Korumaz, 2016). Studies have revealed that principals who have capacities in supporting and guiding their school teachers in technology integration in teaching practice obtain a clear vision of how the technology will contribute to improving projects in shaping the ways students learn in current technological development in education (Chang, 2012; [Korumaz, 2016](#)). The school principals' involvement in the integration of technology is crucial for the programme's sustainability. Fewer studies were conducted to investigate school principals' perception towards ICT integration [more especially in developing countries](#) ([Tondeur, et al., 2009](#) [Killinc, Ogurlu and Sevim 2017](#)). ~~Even fewer were done in developing countries.~~ Therefore, this current study was conducted to comprehensively understand barriers experienced by secondary school

principals regarding technology integration in education in Indonesia as one of the developing countries. The two guiding questions are:

1. What and how are ICT integration external barriers perceived by Indonesian secondary school principals?
2. What and how are ICT integration internal barriers perceived by Indonesian secondary school principals?

## 2. Literature Review

### 2.1 Barriers of ICT integration

Challenges towards ICT integration have been inspiring educational researchers to cover and overcome the barriers to produce successful ICT integration into teaching (Ertmer, 1999). Barriers to ICT integration was defined as conditions which provide difficulties to the successful process of ICT integration in educational setting (Ertmer, 1999; Bingimlas, 2009; Koh, et al., 2013; Tsai & Chai, 2012). — Researchers have discussed barriers in ICT integration in various ways, ~~in various~~ conditions and settings ~~condition and setting~~; — however, two underlined classifications consistently were categorized ~~—~~ and these are external barriers (resources and institutions) and internal barriers (teachers and their attitudes). In early studies, Ertmer (1999) described these barriers with terms ~~of~~ first-order and second-order to ICT integration. ~~She~~ They discussed first- and second-order barriers ~~(Ertmer, 1999)~~ as a comparison to evaluate teachers' integration of ICT in an elementary school ~~(Ertmer, 1999)~~. While researchers such as ~~(Bingimlas, 2009; Koh et al., 2013)~~ hypothesized that the barriers interact in various ways ~~(Bingimlas, 2009; Koh et al., 2013)~~, however, there has been no evidence to show which barriers are the most influential in ICT integration into instruction.

### 2.2 External barriers of ICT integration

Studies have revealed that the external or original first-order barrier of ICT integration, having access to computers and the internet, has been lifted in almost every public school classroom in developed countries (Gray, Thomas and Lewis, 2010). However, in developing countries ~~ie~~ such as Indonesia, the barrier regarding computer and internet facility is still prevalent (Habibi, et al., Mukminin, Riyanto, Prasojo, Sulistiyo, Saudagar and Sofwan, 2018). In addition, some teachers state that limited access to computers and internet is still a main barrier to full integration of ICT (Cuban and Jandric, 2015). Other external barriers are inferior hardware or software ~~;~~ limited administrative peer, and technical support ~~;~~ a lack of training; and a lack of time to improve skills to use computers and the Internet (Ertmer, Ottenbreit-Leftwich and York, 2007; Kim, et al., Kim,

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Lee, Spector and DeMeester, 2013; Kilinc, Ogurlu and Sevim 2017; Schul 2017; Tarman, and Aydin, 2018:). Researchers in educational technology have revealed that these barriers will probably always emerge with the changing of technology including innovation and development as well as the current design of the school system (Hermans, Tondeur, van Braak, and Valcke, et al., 2008; Hsu and Sharma, 2008). Reducing first-order barriers or external barriers requires costly funding and; the reforming of pre-service teacher training models at university level (Ertmer, et al., Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur, 2012; Lim, et al., Zhao, Tondeur, Chai and Tsai, 2013; Machado and Chung, 2015).

### **2.3 Internal barriers**

In addition to external barriers, researchers have found that second-order barriers or internal barriers are more difficult to overcome (Alkhaldeh and Menchaca, 2014; Collins and Halverson, 2009; Cui and Vowell, 2013; Ertmer, et al., 2012). For example, teachers (as practitioners in the teaching and learning process) were found to have many external or first-order barriers, as well as personal or second-order barriers (Alkhaldeh and Menchaca, 2014; Ertmer, et al., 2012). Even those who have had positive attitudes towards ICT integration would eventually develop negative attitudes towards ICT integration because of the first-order barriers they found (Collins and Halverson, 2009). The most common second-order barriers include pedagogical beliefs, motivation, established practices and cultures and personal beliefs about computers (Ertmer, et al., 2012; Mueller, et al., Wood, Willoughby, Ross and Specht, 2008).

### **3. Methodology**

This study was a sequential explanatory design characterized by the collection and analysis of quantitative data in the first phase of the research, followed by the collection and analysis of qualitative data in the second phase (Brannen, 2005; Creswell 2014). A sequential explanatory strategy was used because this study tends sought to use quantitative research. To obtain further information about the results, the phase was followed by qualitative research (Brannen, 2005). This strategy approach emphasized how the qualitative findings helped elaborate or extend the quantitative results (Creswell, 2014).

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Universitas Negeri Yogyakarta, Jambi University, and Jambi Agency of Research and Development (Indonesia) and Universiti Utara Malaysia (Malaysia).

### 3.1 Quantitative phase

We used survey design which provides numeric description using questionnaires for data collection. Survey research aimed to describe the situation and the characteristics of a population (Fraenkel & Wallen, 2009). The population of this study was more than 1000 secondary school principals in one Indonesia. Using random sampling, we distributed the survey instrument to 250 principals; however, only 210 principals returned the survey. Two hundred and one surveys were completed and assessed.

The first step in developing the barriers survey was to review relevant methods literatures instruments (Avidov-Ungar and Shamir-Inbal, 2017; Claro, [et al.](#), [Nussbaum, López and Contardo](#), 2017; Kilinc, Tarman and Aydin, 2018; Serhan, 2007) that were already being used for assessing barriers of technology integration in educational settings. Most of these instruments focused on the way in which internal and external barriers were constructed regarding technology integration. All authors contributed in developing and revising every item in three sessions of discussion. Following the discussion, the instrument was sent to a panel of experts; three experts in educational technology and two experts with degrees in educational policy and management as part of a content validity process (Lawshe, 1975). Each expert was requested to rate ~~to~~ [the](#) extent [to which](#) each question measured using a 10-point scale (with 1 being the least measure and 10 being the greatest measure). The experts were also asked to provide some comments and suggestions for each question and, in some cases, suggested their own possible question list for either internal or external constancy.

After being reviewed by the panel of experts, ~~thirty-two~~[32](#) items were set. However, six items were eliminated because they were not reliable after being piloted with 35 principals. The remaining 26 items were measured with a four-level likert scale: 1. Strongly disagree, 2. Disagree, 3. Agree, [and](#) 4. Strongly agree. In addition to the main instruments, demographic information namely [email](#), gender, age, and experience, as well as educational qualification were also distributed. We collected the data through a printed questionnaire. After obtaining the data, we measured the consistency reliability or coefficient alpha (.79 for internal barriers and .86 for external barriers). According to George and Mallery (2001), the alpha is considered to be acceptable. We used descriptive statistics (Ross, 2010) measuring the mean and standard deviation of the research for the data elaboration.

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### 3.2 Qualitative phase

After the analysis of the quantitative data, Focus Group Discussions (FGD) were conducted to obtain in-depth information regarding barriers in ICT integration using a case study (Creswell, 2014; ~~Patton, 1990; Stake, 1995; Merriam, 1998~~). Creswell (2014) argued that a case study is appropriate if the researcher wants to produce a high-quality theory because a single case study explores and creates deeper theories. ~~They~~ He also stated that the researcher would have better understanding of the explored object namely the research. Choosing a qualitative case study approach in this sequential explanatory design was in order that the findings of this study might not be generalized in the other places or participants (Creswell, 2014).

During the distribution of the survey instrument, we asked the respondents to fill in an availability form confirming whether they were willing to attend the FGDs. Fifty-seven respondents agreed to participate. However, only 30 participants were chosen. The How that choice was made regarding the representative area, financial matter, and other important factors such as convenience sampling (Fraenkel and Wallen, 2009). We masked participants' name in symbols (P1-P30) in the data presentation to protect their human rights/privacy (Creswell, 2014). The chosen participants were contacted by phone calls and short messages and asked to come to the FGD sessions. All costs including transportation, accommodation, and consumption were paid by the authors using the research funding. The FGDs were divided into three sessions, each FGD was attended by 10 participants. Discussions lasting about 120 minutes were recorded and video-taped. The survey instrument provided the set of guiding questions for the semi-structured discussion or interview. Semi-structured questions were applied to understand how some interventions work and how they can be improved. This allows interviewers to discuss issues that may not be considered- (Creswell, 2014). During the FGDs, the participants were free to argue but limited to certain rules introduced at he the beginning of the discussion. We used a sound proofed because of for the transcribing data process, Google docs Voice Typing to transcribe the recording, an online application for data transcription that, Transcriber was used which needs clear sound in the transcribing process.

We analyzed the data using an across and between analysis (Stake, 1995; Creswell, 2014); within case and cross case analysis that consists of thematic conceptual ordered analysis, causal network analysis, and partially ordered analysis (Stake, 1995). We processed the data analysis with equal methods although the participants' background and experience varied. The first activity that the researchers did after obtaining the data from

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focus group discussion was to transcribe the data. Using the latest invention from Google, the data was processed through Google docs voice typing. The next step was to compile this transcription ~~the to Microsoft office~~. After ~~inputting~~ ~~compiling~~ the data, we printed the files in order to examine the data. We read and re-read the transcripts to highlight and examine any connections and omissions. This activity ~~—~~ was lead by one of the researchers. The coding was manually done followed by the translation process which resulted in themes and sub-themes. In relation to the research aim, we focused on the topic in accordance with the survey results; to discover any emerging information in line with the barriers of ICT integration from the principals' perspectives.

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To ensure the trustworthiness of the study, we included verbatim examples from the transcribed interviews (Lincoln and Guba, 1985). We also carried out member checking (~~Johnson and Christensen, 2008~~; Creswell, 2014; ~~Habibi, et al., Mukminin, Sofwan and Sulistiyo, 2017~~). We checked not only all participants of the FGDs but also all co-researchers serving as member checking. In this stage, we returned all the data of the FGDs and our findings to all participants in order to get their feedback and agreement. This step was taken to ensure that our data presentation was without bias. All participants of the FGDs gave consent for us to use the data for our study.

#### 4. Findings

Two hundred and one measurable responses were received out of 250 distributed printed questionnaires, of which, male samples almost quadrupled female samples. The largest age group was 40–50 years, accounting for 43.28%. Regarding the educational qualification, most of the participants (62.69%) graduated from postgraduate schools, Masters levels. Only one of them was Doctor of Education. Ninety-three participants had experience from 1 to 10 years in being a school principal. Only 7 participants had experience of above 30 years. Table 1 shows the detailed sample demographics. Table

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Demographic questionnaire (n. 201)

Information	Frequency	Percent (%)
Gender		
(1) Male	164	81.59
(2) Female	37	18.41
Age		
(1) Below 30	2	1

(2) 30-40	48	23.88
(3) 40-50	87	43.28
(4) Above 50	64	31.84
Experience as school principals		
(1) 1-10	93	46.27
(2) 11-20	79	39.30
(3) 20-30	22	10.95
(4) Above 30	7	3.48
Educational qualification		
(1) Undergraduate	74	36.82
(2) Master	126	62.69
(3) Doctoral	1	0.48

#### 4.1 Quantitative phase

To explore school principals' perceptions on ICT integration barriers, we calculated descriptive statistics (frequency, percentage, mean, and standard deviation) for each item. In the survey, we included items from an external barrier perspective (Q1–Q14) and an internal perspective (Q16–Q26). Table 2 depicts the frequency and percentage for each answer and the mean and standard deviations for each of the 14 indicators of external barriers. Based on the mean scores, principals agreed in most statements, for example, “professional development courses provided by the authorities were irrelevant to school needs for technology integration”, there is inability to provide computers in classroom”, and there is no support to refresh programmes for older computers and other devices. However, some items seemed to have strong “disagreement” perception on some items such as “technology integration spends too much time for teaching”, “the school curriculum does not allow much time for technology integration”, and “the condition of classrooms is not suitable for integrating technology”.

Table 2:

External barriers mean and SD

Item	Mean	SD
Professional development courses provided by the authorities were irrelevant to school needs for technology integration.	3.45	.53
There is inability to provide computers in classroom	3.45	.60
There is no support to refresh program for older computers and other	3.45	.61

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devices		
There is no support from district authority for ICT needs	3.44	.61
The ICT is easily damage because the school culture is not supportive	3.41	.60
supportive		
There is inability to provide Internet _ _ in classrooms	3.41	.61
There is inability to provide Internet _ _ in school	3.38	.60
There is insufficient technical support to solve technological problems	3.29	.59
There is inability to provide computers in school	3.15	.80
Technology integration requires too much time for teaching	2.15	.51
The school curriculum does not allow much time for technology integration	2.00	.64
integration		
The condition of classrooms is not suitable for integrating technology	1.98	.64
High-stake test restricts the use of technology	1.97	.56
Teachers cannot access softwares that they can utilize for their class	1.95	.60
Cronbach's alpha		.79

For the internal barriers (see Table 3), five statements were positively perceived by the respondents; "I think that the teachers in my school lack knowledge to integrate ICT with pedagogy", "I think that the teachers in my school lack knowledge to integrate ICT with the content of the course", "I think that the teachers in my school lack confidence in using ICT", and "I think that the teachers in my school lack knowledge of ICT use". On the other hand, more than seven statements were negatively perceived, for example, "The integration of technology decreases students' attention and concentration to the lesson", "Technology integration limits teachers' role in the classroom", and "Technology integration makes teaching become more teacher centered". Table 3:

#### Internal barriers mean and SD

Item	Mean	SD
I think that the teachers in my school lack knowledge to integrate ICT with pedagogy	3.78	.44
I think that the teachers in my school lack knowledge to integrate ICT with content of the course	3.68	.52
I think that the teachers in my school lack confidence in using ICT	3.60	.57
I think that the teachers in my school lack knowledge of ICT use	3.41	.61

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The teachers preferred traditional teaching styles rather than using technology	3.30	.53
Technology integration makes teaching become more teacher centered.	2.03	.64
I don't believe teachers would know how to effectively integrate technology into the teaching process	2.00	.62
Rapid developments of technology makes me worried	1.94	.92
Technology integration make classroom management become less effective	1.87	.53
Technology integration limits teachers' role in the classroom.	1.86	.66
Technology integration limits student centered learning.	1.83	.67
The integration of technology decreases students' attention and concentration to the lesson.	1.83	.66
Cronbach's alpha		.86

#### 4.2 Qualitative phase

We presented all 30 participants' responses in the focus group discussions to determine the sub-themes of the study. We categorized the sub-themes based on two main themes as previously discussed in the quantitative phase namely external barriers and internal barriers. We established the sub-themes identified by 50% or more of the participants in the FGDs. Four sub-themes for the external barriers and three sub-themes for internal barriers emerged from this study (see Table 4). Table 4

##### *Themes and sub-themes from FGDs about barriers of ICT integration*

Sub-themes		Number of participants	Frequency of responses
External barriers	• Lack of funding	30	75
	• Lack of professional development	25	67
	• School culture	23	59
	• District culture	15	35
Internal barriers	• lack of teachers' knowledge of ICT and its integration for active learning	29	87

• lack of teachers' understanding <u>of</u> ICT and its integration	29	84
• Traditional teaching styles	22	74

### **External barriers**

There are four sub-themes for external barriers which include Lack of funding, Lack of professional development, School culture, and district culture. 75 responses in the FGDs indicated that the lack of funding for ICT was one of the barriers to successfully integrating ICT in their school. Participants revealed that schools need to purchase new ICT devices for educational purposes, connect the wireless network for the Internet and replace older ICT devices. These needs should be supported by sufficient funding. Two of the participants stated (*Quoted verbatim*),

“When we want to increase our ICT integration in schools, we need more devices such as computer, projector, and more importantly the Internet. Inter,”  
(P1)

“I would to state that there are plenty of older device in our schools that need to be replaced by the new ones. However, we have not enough budget to spend within this need.” (P27)

The second external barrier discussed in the ~~FGDs~~ ~~was~~ ~~FGDs was~~ lack of professional development. More than 83% of the participants had the perception that there were significant barriers to integrating ICT in line with the lack of professional development ~~for teachers~~ ~~for teachers~~ to improve both their knowledge of ICT skill and ICT integration into teaching. One of the participants stated that although there had been good ICT devices available in the school for teaching and learning processes, there was insufficient training or workshops to support the ICT integration performance. Another participant indicated that many ICT-based professional development programmes did not have adequate follow-up training, workshops, or field practices on how to effectively use ICT for instruction. P12 noted that many ~~—~~ programmes offered by either public or private institutions did not support, not only teachers to extend the use of ICT during teaching and learning processes and the significant advantages using technology compared to traditional teaching styles, but also principals to manage the administration and do supervision in relation to ICT integration in education.

The third external barrier found in this study was school culture. Twenty-three participants perceived that the culture of schools could also be a significant barrier for ICT integration in their school. One participant reported that when teachers were told that there



would be new ICT devices for instructional activities, they made comments such as, “We purchase ICT devices, then the irresponsible students damage them. It is so annoying that the situation might happen in our school”. In addition to broken devices caused by a few students, some school principals believed that school cultures including the way teachers in the classroom are ingrained, prevent or hinder ICT integration during teaching and learning processes. One of the participants noted,

“If the government want to make ICT integration become a success story. It needs to establish school culture that embraces the use of such technologies.”  
(P15)

Half of the participant (15 principals) with thirty-five responses mentioned that the district culture was also a barrier to technology integration in this study. Five participants shared in the discussions that the culture of district became one of the competitive challenges for limited ICT resources in their school. One of the participants, (P6) said that the head of the department in charge for operational staff in his district was a barrier because he neither supported the ICT integration nor purchased ICT devices for the school in his district.

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### ***Internal barriers***

The internal barriers revealed in this qualitative phase our were lack of teachers’ knowledge of ICT and its integration for active learning, lack of teachers’ understanding of ICT and its integration and traditional teaching styles (see Table 4). The first internal barrier identified was lack of teachers’ knowledge of ICT and its integration for active learning perceived by most participants in the FGDs. One participant (P10) reported that the barrier was related to “how proficient the teachers understand technology in general and how good they integrate ICT into their classroom routines.” Another participant (P13) declared that this lack of knowledge of ICT and its integration was “the most important factor predicting the teachers’ decision to use or not to use ICT in their instructional activities.”

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\_\_\_\_\_Lack of teachers’ understanding of ICT and ICT integration was another sub-theme revealed from the qualitative analysis. We identified this sub-theme from twenty-nine participants’ opinions in the FGDs. One of the participants (P7) revealed “Self-efficacy of the teachers are a significant barrier for ICT integration in my school. I have even talked to some of them and they informed me that they lack have lack confidence teaching with ICT.” Another principal (P2) also said that understanding for ICT integration was not the

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only barrier, but also understanding using the ICT devices as a barrier informed in this study.

Twenty-two participants indicated that the traditional teaching style was another barrier to ICT integration in the school they lead. Participants took the view that the uneasy shift from the teacher-centred teaching class to student-centred learning was a barrier. One participant (P28) said that teachers, especially senior teachers, have had many years of training and practices to conduct instructional activities in a specific way where students just listen to their lecture with no innovation in the teaching and learning processes.

## 5. Discussion

The preliminary findings of this study indicated that the most highly identified external barriers were mainly related to lack of funding such as inability to provide computers and the Internet in classrooms, no support to refresh programmes for older computers and other devices as well as insufficient technical supports to solve technological problems. This result is somewhat surprising because the Indonesian government has spent 20 % of the national budget on educational funding including the cost of ICT implementation and its support (Sofwan and Habibi, 2016; Luschei, 2017). The results agree with some previous related studies in other developing countries (Kilinc, Tarman and Aydin, 2018; [Kilinc, Ogurlu and Sevim 2017](#); [Neville, 2004](#); [Schul 2017](#)), which maintained that teachers perceived a lack of funding to provide computers' software and hardware as well as the internet as barriers for technology integration. Another study by Wachira and Keengwe (2011) reported that Japanese schools found formidable barriers, specifically the absence of media specialists/technology technicians similar to this study result.

Professional development regarding ICT integration for effective and efficient teaching and learning processes is an essential component to promote the use of ICT during instruction ([Darling-Hammond, et al., Wei, Andree, Richardson and Orphanos, 2009](#); Derbel, 2017). However, professional development programmes can be, in some circumstances condition, be perceived as one of the significant barriers for ICT integration when the programmes are not in relation to actual teaching practices or merely focused on ICT skill development (Tarman and Chigisheva 2017). This study also revealed similar results, the Indonesian school principals stated that the professional development courses that teachers need to attend were not relevant to their needs for integrating ICT. They perceived insufficient technology-related professional developments as one of the barriers. Briefly, the conclusion can be drawn that the perceived barriers of school principals to ICT integration in instructional activities show similarities across time, space, and culture.

From the survey and FGDs, it is revealed that the participants of this study believed that teachers' lack of knowledge of ICT and its integration, lack of confidence in using ICT integration, and beliefs in traditional teaching styles were the external barriers for ICT integration. Teachers' level of ICT skill and confidence were predicting factors and had a significant influence on the quantity of ICT integration used to support teaching and learning processes (Cui and Vowell, 2013; Alkhalaf and Menchaca, 2014). One of the significant findings revealed that the lack of necessary knowledge is an unavoidable barrier to ICT integration in education (Mackenzie 2013).

In addition to teachers' lack of knowledge and confidence of ICT and its integration, traditional teaching styles were also revealed as a barrier that could not easily be overcome. This barrier is very complicated and has been rooted in school teaching cultures in relation to teachers' background, education and experiences, and thus it is difficult to overcome (Levin and Wadmany, 2008; Tondeur, et al., 2009; Cuban and Jandric, 2015;). Most principals that participated in the FGDs believed that the traditional teaching style was a lasting barrier for many teachers, particularly older teachers. This finding is in alignment with previous studies (Ertmer, et al., 2012; Kim, et al., 2013; Mueller, et al., 2008).

## 6. Implication

This study recommends that district-level educational authorities should provide and develop professional development training programmes for principals and teachers to improve effective ICT plans with an emphasis on ICT integration in schools. This training programme is crucial for principals to comprehend and evaluate the significance of collaborating to establish set specific goals regarding ICT integration, setting an appropriate budget plan for ICT purchases and updating old technological devices, and recognizing supports for teachers, as well as including balanced professional development opportunities. When principals are trained, they will be able to start the process of revision or development, and finalisation of a technology plan with real effectiveness for the school.

Principals should be committed to working in collaboration with schools' staff members to develop a short and long term ICT integration plan. Early steps would be developing the current inventory of technologies, teachers' needs, and annual objectives for a computer ratio for students. In addition, schools should move towards a programme of one device per student. They should plan to utilize and organize computer labs to support academic activities. This plan should include the proposal of funding sources and the potential funding capacity to purchase new technological devices, renew old and slow

devices and support the maintenance of the wireless capacity within their school sites. The district's technology departmental authorities should be invited to get involved, or at least to have a discussion and consultation when the plan is established and implemented.

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# An Explanatory Sequential Study on Indonesian Principals' Perceptions on ICT Integration Barriers

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**Abstract:** This explanatory sequential study investigated secondary school principals' perceptions on barriers regarding the Information and Communication Technology (ICT) integration in a developing country, Indonesia. For the quantitative phase, we administered a survey instrument to 250 Indonesian secondary school principals. The survey instrument was developed based on previous related literature validated through content validity and piloted before being distributed. Following the quantitative process, three Focus Group Discussions (FGDs) with 30 participants were conducted to obtain more in-depth information. Each FGD was attended by 10 participants. The findings revealed that the most highly identified barriers are teachers' knowledge of ICT, funding for ICT, traditional teaching style, professional development, as well as district and school culture. Recommendations are offered for the improvement of technology integration for educational purpose.

**Keywords:** barriers, Indonesia, technology integration, secondary school principals, developing country

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## 1. Introduction

In teaching, the role of technology is currently transforming and is becoming one of the most important influential factors. The role has been widely discussed in some current educational policy studies (Charbonneau-Gowdy, 2018; Nortvig, Petersen and Balle, 2018). If technology had been properly integrated in instructional activities, it would have led to great expectation in the improvement of teaching and learning, and shaping opportunities for future workforce (Mishra and Koehler, 2006). Through the history of technology integration, technology illiteracy is now considered as the new form of illiteracy (Rosen and Michelle, 1995). This fact has lead policy makers in every country in the world to gain a new strong intention and effort to equip schools and universities with Information and Communicating Technology (ICT) infrastructures such as computers and internet access as well as providing qualified staff, teachers and administrators to produce quality students as the next generation who are proficient in technology use for every opportunity in the future. There is no dispute that computers and internet use have been able to aid the teaching and learning process as well as to provide proper opportunities to facilitate students' learning. Many studies have underlined positive integration effects of technology in instructional processes (e.g. Ertmer and Ottenbreit-Leftwich, 2010; Deng, et al., 2014; Kimmons, et al., 2015).

In addition to the positive effects of integration, breaking down barrier should also be considered and any strategy that seeks to change teaching practice should consider the social and cultural context of the school organization (Hargreaves, et al., 2001; Tondeur, et al., 2009). One common issue when implementing new strategies with ICT is that the stakeholders tend to focus on adopting the technology, without providing the appropriate conditions for the social and cultural learning that is required for such an innovation (Hargreaves, et al., 2001). Among these circumstances, all school members who are involved should adopt a common approach, including school administrators or principals. This common approach includes their perception towards barriers of ICT integration in an educational setting (Alghamdi and Prestridge, 2015).

For school administrators, the logical approach is one of the most vital things regarding barriers of ICT integration in schools. The principals are very important in creating the conditions required for a school reform to be finally beneficial for ICT integration (Hargreaves, et al., 2001; Korumaz, 2016). Studies have revealed that principals who have capacities in supporting and guiding their school teachers in technology integration in teaching practice obtain a clear vision of how the technology will contribute to improving projects in shaping the ways students learn in current technological development in education (Chang, 2012; Korumaz, 2016). The school principals' involvement in the integration of technology is crucial for the programme's sustainability. Fewer studies were conducted to investigate school principals' perception towards ICT integration more especially in developing countries (Tondeur, et al., 2009). Therefore, this current study was conducted to comprehensively understand barriers experienced by secondary school principals regarding technology integration in education in Indonesia as one of the developing countries. The two guiding questions are:

1. What and how are ICT integration external barriers perceived by Indonesian secondary school principals?
2. What and how are ICT integration internal barriers perceived by Indonesian secondary school principals?

## **2. Literature review**

### **2.1 Barriers of ICT integration**

Challenges towards ICT integration have been inspiring educational researchers to cover and overcome the barriers to produce successful ICT integration into teaching (Ertmer, 1999). Barriers to ICT integration was defined as conditions which provide difficulties to the successful process of ICT integration in educational setting (Ertmer, 1999; Bingimlas, 2009; Koh, et al., 2013; Tsai & Chai, 2012). Researchers have discussed barriers in ICT integration in various ways, conditions and settings however, two underlined classifications consistently were categorized and these are external barriers (resources and institutions) and internal barriers (teachers and their attitudes). In early studies, Ertmer (1999) described these barriers with terms of first-order and second-order to ICT integration. She discussed first- and second-order barriers as a comparison to evaluate teachers' integration of ICT in an elementary school (Ertmer, 1999). While researchers such as (Bingimlas, 2009; Koh et al., 2013) hypothesized that the barriers interact in various ways however, there has been no evidence to show which barriers are the most influential in ICT integration into instruction.

### **2.2 External barriers of ICT integration**

Studies have revealed that the external or original first-order barrier of ICT integration, having access to computers and the internet, has been lifted in almost every public school classroom in developed countries (Gray, Thomas and Lewis, 2010). However, in developing countries such as Indonesia, the barrier regarding computer and internet facility is still prevalent (Habibi, et al., 2018). In addition, some teachers state that limited access to computers and internet is still a main barrier to full integration of ICT (Cuban and Jandric, 2015). Other external barriers are inferior hardware or software, limited peer, and technical support, lack of training and a lack of time to improve skills to use computers and the Internet (Ertmer, Ottenbreit-Leftwich and York, 2007; Kim, et al., 2013; Kilinc, Tarman and Aydin, 2018). Researchers in educational technology have revealed that these barriers will probably always emerge with the changing of technology including innovation and development as well as the current design of the school system (Hermans, et al., 2008). Reducing first-order barriers or external barriers requires costly funding and the reforming of pre-service teacher training models at university level (Ertmer, et al., 2012; Lim, et al., 2013; Machado and Chung, 2015).

### **2.3 Internal barriers**

In addition to external barriers, researchers have found that second-order barriers or internal barriers are more difficult to overcome (Alkhalil and Menchaca, 2014; Collins and Halverson, 2009; Cui and Vowell, 2013; Ertmer, et al., 2012). For example, teachers as practitioners in the teaching and learning process were found to have many external or first-order barriers, as well as personal or second-order barriers (Alkhalil and Menchaca, 2014; Ertmer, et al., 2012). Even those who have had positive attitudes towards ICT integration would eventually develop negative attitudes towards ICT integration because of the first-order barriers they found (Collins and Halverson, 2009). The most common second-order barriers include pedagogical beliefs, motivation, established practices and cultures and personal beliefs about computers (Ertmer, et al., 2012; Mueller, et al., 2008).



### 3. Methodology

This study was a sequential explanatory design characterized by the collection and analysis of quantitative data in the first phase of the research, followed by the collection and analysis of qualitative data in the second phase (Brannen, 2005; Creswell 2014). A sequential explanatory strategy was used because this study sought to use quantitative research. To obtain further information about the results, the phase was followed by qualitative research (Brannen, 2005). This approach emphasized how the qualitative findings helped elaborate or extend the quantitative results (Creswell, 2014).

This study was financially supported by the Indonesian Ministry of Higher Education, Technology and Research which took almost a whole year to complete. The authors are from three universities of two countries and one research institution, Universitas Negeri Yogyakarta, Jambi University, and Jambi Agency of Research and Development (Indonesia) and Universiti Utara Malaysia (Malaysia).

#### 3.1 Quantitative phase

We used survey design which provides numeric description using questionnaires for data collection. Survey research aimed to describe the situation and the characteristics of a population (Fraenkel & Wallen, 2009). The population of this study was more than 1000 secondary school principals in one Indonesia. Using random sampling, we distributed the survey instrument to 250 principals; however, only 210 principals returned the survey. Two hundred and one surveys were completed and assessed.

The first step in developing the barriers survey was to review relevant methods literatures instruments (Avidov-Ungar and Shamir-Inbal, 2017; Claro, et al., 2017; Kilinc, Tarman and Aydin, 2018; Serhan, 2007) that were already being used for assessing barriers of technology integration in educational settings. Most of these instruments focused on the way in which internal and external barriers were constructed regarding technology integration. All authors contributed in developing and revising every item in three sessions of discussion. Following the discussion, the instrument was sent to a panel of experts; three experts in educational technology and two experts with degrees in educational policy and management as part of a content validity process (Lawshe, 1975). Each expert was requested to rate the extent to which each question measured using a 10-point scale (with 1 being the least measure and 10 being the greatest measure). The experts were also asked to provide some comments and suggestions for each question and, in some cases, suggested their own possible question list for either internal or external constancy.

After being reviewed by the panel of experts, 32 items were set. However, six items were eliminated because they were not reliable after being piloted with 35 principals. The remaining 26 items were measured with a four-level likert scale: 1. Strongly disagree, 2. Disagree, 3. Agree, and 4. Strongly agree. In addition to the main instruments, demographic information namely gender, age, and experience, as well as educational qualification were also distributed. We collected the data through a printed questionnaire. After obtaining the data, we measured the consistency reliability or coefficient alpha (.79 for internal barriers and .86 for external barriers). According to George and Mallery (2001), the alpha is considered to be acceptable. We used descriptive statistics (Ross, 2010) measuring the mean and standard deviation of the research for the data elaboration.

#### 3.2 Qualitative phase

After the analysis of the quantitative data, Focus Group Discussions (FGD) were conducted to obtain in-depth information regarding barriers in ICT integration using a case study (Creswell, 2014; Stake, 1995). Creswell (2014) argued that a case study is appropriate if the researcher wants to produce a high-quality theory because a single case study explores and creates deeper theories. He also stated that the researcher would have better understanding of the explored object namely the research. Choosing a qualitative case study approach in this sequential explanatory design was in order that the findings of this study might not be generalized in the other places or participants (Creswell, 2014).

During the distribution of the survey instrument, we asked the respondents to fill in an availability form confirming whether they were willing to attend the FGDs. Fifty-seven respondents agreed to participate. However, only 30 participants were chosen. The choice was made regarding the representative area, financial matter, and other important factors (Fraenkel and Wallen, 2009). We masked participants' name in symbols (P1-P30) in the data presentation to protect their privacy (Creswell, 2014). The chosen participants were

contacted by phone calls and short messages and asked to come to the FGD sessions. All costs including transportation, accommodation, and consumption were paid by the authors using the research funding. The FGDs were divided into three sessions; each FGD was attended by 10 participants. Discussions lasting about 120 minutes were recorded and video-taped. The survey instrument provided the set of guiding questions for the semi-structured discussion or interview. Semi-structured questions were applied to understand how some interventions work and how they can be improved. This allows interviewers to discuss issues that may not be considered (Creswell, 2014). During the FGDs, the participants were free to argue but limited to certain rules introduced at the beginning of the discussion. We used Google docs Voice Typing to transcribe the recording, an online application for data transcription that needs clear sound in the process.

We analyzed the data using within-case and cross-case analysis that consists of thematic conceptual-ordered analysis, causal network analysis, and partially ordered analysis (Stake, 1995). We processed the data analysis with equal methods although the participants' background and experience varied. The first activity that the researchers did after obtaining the data from focus group discussion was to transcribe the data. Using the latest invention from Google, the data was processed through Google docs voice typing. The next step was to compile this transcription. After compiling the data, we printed the files in order to examine the data. We read and re-read the transcripts to highlight and examine any connections and omissions. This activity was led by one of the researchers. The coding was manually done followed by the translation process which resulted in themes and sub-themes. In relation to the research aim, we focused on the topic in accordance with the survey results; to discover any emerging information in line with the barriers of ICT integration from the principals' perspectives.

To ensure the trustworthiness of the study, we included verbatim examples from the transcribed interviews (Lincoln and Guba, 1985). We also carried out member checking (Creswell, 2014). We checked not only all participants of the FGDs but also all co-researchers serving as member checking. In this stage, we returned all the data of the FGDs and our findings to all participants in order to get their feedback and agreement. This step was taken to ensure that our data presentation was without bias. All participants of the FGDs gave consent for us to use the data for our study.

#### 4. Findings

Two hundred and one measurable responses were received out of 250 distributed printed questionnaires, of which, male samples almost quadrupled female samples. The largest age group was 40–50 years, accounting for 43.28%. Regarding the educational qualification, most of the participants (62.69%) graduated from postgraduate schools, Masters levels. Only one of them was Doctor of Education. Ninety-three participants had experience from 1 to 10 years in being a school principal. Only 7 participants had experience of above 30 years. Table 1 shows the detailed sample demographics.

**Table 1:** Demographic questionnaire (n. 201)

Information	Frequency	Percent (%)
Gender		
(1) Male	164	81.59
(2) Female	37	18.41
Age		
(1) Below 30	2	1
(2) 30-40	48	23.88
(3) 40-50	87	43.28
(4) Above 50	64	31.84
Experience as school principals		
(1) 1-10	93	46.27
(2) 11-20	79	39.30
(3) 20-30	22	10.95
(4) Above 30	7	3.48
Educational qualification		
(1) Undergraduate	74	36.82
(2) Master	126	62.69
(3) Doctoral	1	0.48

#### 4.1 Quantitative phase

To explore school principals' perceptions on ICT integration barriers, we calculated descriptive statistics (frequency, percentage, mean, and standard deviation) for each item. In the survey, we included items from an external barrier perspective (Q1–Q14) and an internal perspective (Q16–Q26). Table 2 depicts the frequency and percentage for each answer and the mean and standard deviations for each of the 14 indicators of external barriers. Based on the mean scores, principals agreed in most statements, for example, “professional development courses provided by the authorities were irrelevant to school needs for technology integration”, there is inability to provide computers in classroom”, and there is no support to refresh programmes for older computers and other devices. However, some items seemed to have strong “disagreement” perception on some items such as “technology integration spends too much time for teaching”, “the school curriculum does not allow much time for technology integration”, and “the condition of classrooms is not suitable for integrating technology”.

**Table 2:** External barriers mean and SD

Item	Mean	SD
Professional development courses provided by the authorities were irrelevant to school needs for technology integration.	3.45	.53
There is inability to provide computers in classroom	3.45	.60
There is no support to refresh program for older computers and other devices	3.45	.61
There is no support from district authority for ICT needs	3.44	.61
The ICT is easily damage because the school culture is not supportive	3.41	.60
There is inability to provide Internet in classrooms	3.41	.61
There is inability to provide Internet in school	3.38	.60
There is insufficient technical support to solve technological problems	3.29	.59
There is inability to provide computers in school	3.15	.80
Technology integration requires too much time for teaching	2.15	.51
The school curriculum does not allow much time for technology integration	2.00	.64
The condition of classrooms is not suitable for integrating technology	1.98	.64
High-stake test restricts the use of technology	1.97	.56
Teachers cannot access softwares that they can utilize for their class	1.95	.60
Cronbach's alpha		.79

For the internal barriers (see Table 3), five statements were positively perceived by the respondents; “I think that the teachers in my school lack knowledge to integrate ICT with pedagogy”, “I think that the teachers in my school lack knowledge to integrate ICT with the content of the course”, “I think that the teachers in my school lack confidence in using ICT”, and “I think that the teachers in my school lack knowledge of ICT use”. On the other hand, more than seven statements were negatively perceived, for example, “The integration of technology decreases students' attention and concentration to the lesson”, “Technology integration limits teachers' role in the classroom”, and “Technology integration makes teaching become more teacher centered”.

**Table 3:** Internal barriers mean and SD

Item	Mean	SD
I think that the teachers in my school lack knowledge to integrate ICT with pedagogy	3.78	.44
I think that the teachers in my school lack knowledge to integrate ICT with content of the course	3.68	.52
I think that the teachers in my school lack confidence in using ICT	3.60	.57
I think that the teachers in my school lack knowledge of ICT use	3.41	.61
The teachers preferred traditional teaching styles rather than using technology	3.30	.53
Technology integration makes teaching become more teacher centered.	2.03	.64

Item	Mean	SD
I don't believe teachers would know how to effectively integrate technology into the teaching process	2.00	.62
Rapid developments of technology makes me worried	1.94	.92
Technology integration make classroom management become less effective	1.87	.53
Technology integration limits teachers' role in the classroom.	1.86	.66
Technology integration limits student centered learning.	1.83	.67
The integration of technology decreases students' attention and concentration to the lesson.	1.83	.66
Cronbach's alpha		.86

## 5. Qualitative phase

We presented all 30 participants' responses in the focus group discussions to determine the sub-themes of the study. We categorized the sub-themes based on two main themes as previously discussed in the quantitative phase namely external barriers and internal barriers. We established the sub-themes identified by 50% or more of the participants in the FGDs. Four sub-themes for the external barriers and three sub-themes for internal barriers emerged from this study (see Table 4).

**Table 4:** Themes and sub-themes from FGDs about barriers of ICT integration

Themes	Sub-themes	Number of participants	Frequency of responses
External barriers	• Lack of funding	30	75
	• Lack of professional development	25	67
	• School culture	23	59
	• District culture	15	35
Internal barriers	• lack of teachers' knowledge of ICT and its integration for active learning	29	87
	• lack of teachers' understanding of ICT and its integration	29	84
	• Traditional teaching styles	22	74

### External barriers

There are four sub-themes for external barriers which include Lack of funding, Lack of professional development, School culture, and district culture. 75 responses in the FGDs indicated that the lack of funding for ICT was one of the barriers to successfully integrating ICT in their school. Participants revealed that schools need to purchase new ICT devices for educational purposes, connect the wireless network for the Internet and replace older ICT devices. These needs should be supported by sufficient funding. Two of the participants stated (*Quoted verbatim*),

"When we want to increase our ICT integration in schools, we need more devices such as computer, projector, and more importantly the Internet. Inter," (P1)

"I would to state that there are plenty of older device in our schools that need to be replaced by the new ones. However, we have not enough budget to spend within this need." (P27)

The second external barrier discussed in the FGDs was lack of professional development. More than 83% of the participants had the perception that there were significant barriers to integrating ICT in line with the lack of professional development for teachers to improve both their knowledge of ICT skill and ICT integration into teaching. One of the participants stated that although there had been good ICT devices available in the school for teaching and learning processes, there was insufficient training or workshops to support the ICT integration performance. Another participant indicated that many ICT-based professional development programmes did not have adequate follow-up training, workshops, or field practices on how to effectively use ICT for

instruction. P12 noted that many programmes offered by either public or private institutions did not support, not only teachers to extend the use of ICT during teaching and learning processes and the significant advantages using technology compared to traditional teaching styles, but also principals to manage the administration and do supervision in relation to ICT integration in education.

The third external barrier found in this study was school culture. Twenty-three participants perceived that the culture of schools could also be a significant barrier for ICT integration in their school. One participant reported that when teachers were told that there would be new ICT devices for instructional activities, they made comments such as, "We purchase ICT devices, then the irresponsible students damage them. It is so annoying that the situation might happen in our school". In addition to broken devices caused by a few students, some school principals believed that school cultures including the way teachers in the classroom are ingrained, prevent or hinder ICT integration during teaching and learning processes. One of the participants noted,

"If the government want to make ICT integration become a success story. It needs to establish school culture that embraces the use of such technologies." (P15)

Half of the participant (15 principals) with thirty-five responses mentioned that the district culture was also a barrier to technology integration in this study. Five participants shared in the discussions that the culture of district became one of the competitive challenges for limited ICT resources in their school. One of the participants, (P6) said that the head of the department in charge for operational stuff in his district was a barrier because he neither supported the ICT integration nor purchased ICT devices for the school in his district.

### **Internal barriers**

The internal barriers revealed in this qualitative phase our were lack of teachers' knowledge of ICT and its integration for active learning, lack of teachers' understanding of ICT and its integration and traditional teaching styles (see Table 4). The first internal barrier identified was lack of teachers' knowledge of ICT and its integration for active learning perceived by most participants in the FGDs. One participant (P10) reported that the barrier was related to "how proficient the teachers understand technology in general and how good they integrate ICT into their classroom routines." Another participant (P13) declared that this lack of knowledge of ICT and its integration was "the most important factor predicting the teachers' decision to use or not to use ICT in their instructional activities."

Lack of teachers' understanding of ICT and ICT integration was another sub-theme revealed from the qualitative analysis. We identified this sub-theme from twenty-nine participants' opinions in the FGDs. One of the participants (P7) revealed "Self-efficacy of the teachers is a significant barrier for ICT integration in my school. I have even talked to some of them and they informed me that they lack have lack confidence teaching with ICT." Another principal (P2) also said that understanding for ICT integration was not the only barrier, but also understanding using the ICT devices as a barrier informed in this study.

Twenty-two participants indicated that the traditional teaching style was another barrier to ICT integration in the school they lead. Participants took the view that the uneasy shift from the teacher-centred teaching class to student-centred learning was a barrier. One participant (P28) said that teachers, especially senior teachers, have had many years of training and practices to conduct instructional activities in a specific way where students just listen to their lecture with no innovation in the teaching and learning processes.

## **6. Discussion**

The preliminary findings of this study indicated that the most highly identified external barriers were mainly related to lack of funding such as inability to provide computers and the Internet in classrooms, no support to refresh programmes for older computers and other devices as well as insufficient technical supports to solve technological problems. This result is somewhat surprising because the Indonesian government has spent 20 % of the national budget on educational funding including the cost of ICT implementation and its support (Sofwan and Habibi, 2016; Luschei, 2017). The results agree with some previous related studies in other developing countries (Kilinc, Tarman and Aydin, 2018), which maintained that teachers perceived a lack of funding to provide computers' software and hardware as well as the internet as barriers for technology

integration. Another study by Wachira and Keengwe (2011) reported that Japanese schools found formidable barriers, specifically the absence of media specialists/technology technicians similar to this study result. Professional development regarding ICT integration for effective and efficient teaching and learning processes is an essential component to promote the use of ICT during instruction (Derbel, 2017). However, professional development programmes can be, in some circumstances condition, be perceived as one of the significant barriers for ICT integration when the programmes are not in relation to actual teaching practices or merely focused on ICT skill development (Tarman and Chigisheva 2017). This study also revealed similar results, the Indonesian school principals stated that the professional development courses that teachers need to attend were not relevant to their needs for integrating ICT. They perceived insufficient technology-related professional developments as one of the barriers. Briefly, the conclusion can be drawn that the perceived barriers of school principals to ICT integration in instructional activities show similarities across time, space, and culture.

From the survey and FGDs, it is revealed that the participants of this study believed that teachers' lack of knowledge of ICT and its integration, lack of confidence in using ICT integration delete, and beliefs in traditional teaching styles were the external barriers for ICT integration. Teachers' level of ICT skill and confidence were predicting factors and had a significant influence on the quantity of ICT integration used to support teaching and learning processes (Cui and Vowell, 2013; Alkhalwaldeh and Menchaca, 2014 ). One of the significant findings revealed that the lack of necessary knowledge is an unavoidable barrier to ICT integration in education (Mackenzie 2013).

In addition to teachers' lack of knowledge and confidence of ICT and its integration, traditional teaching styles were also revealed as a barrier that could not easily be overcome. This barrier is very complicated and has been rooted in school teaching cultures in relation to teachers' background, education and experiences, and thus it is difficult to overcome (Tondeur, et al., 2009; Cuban and Jandric, 2015;). Most principals that participated in the FGDs believed that the traditional teaching style was a lasting barrier for many teachers, particularly older teachers. This finding is in alignment with previous studies (Ertmer, et al., 2012; Kim, et al., 2013; Mueller, et al., 2008).

## 7. Implication

This study recommends that district-level educational authorities should provide and develop professional development training programmes for principals and teachers to improve effective ICT plans with an emphasis on ICT integration in schools. This training programme is crucial for principals to comprehend and evaluate the significance of collaborating to establish set specific goals regarding ICT integration, setting an appropriate budget plan for ICT purchases and updating old technological devices, and recognizing supports for teachers, as well as including balanced professional development opportunities. When principals are trained, they will be able to start the process of revision or development, and finalisation of a technology plan with real effectiveness for the school.

Principals should be committed to working in collaboration with schools' staff members to develop a short and long term ICT integration plan. Early steps would be developing the current inventory of technologies, teachers' needs, and annual objectives for a computer ratio for students. In addition, schools should move towards a programme of one device per student. They should plan to utilize and organize computer labs to support academic activities. This plan should include the proposal of funding sources and the potential funding capacity to purchase new technological devices, renew old and slow devices and support the maintenance of the wireless capacity within their school sites. The district's technology departmental authorities should be invited to get involved, or at least to have a discussion and consultation when the plan is established and implemented.

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