

# Digital Divide and Cloud Computing

## A Case Study in a Rural Area of Taiwan

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# Agenda

- Digital Divide
- Case Study
- Cloud Computing
- Proposed Project



# *Digital Divide*



# *Digital Divide*

The divide between those with access to new technologies and those without [NTIA1999].

# *In Taiwan*

- The first dissertation about digital divide was written in 2002.
- The number of dissertations increased until the year 2008, and since 2009, the situation has declined.

# Table I

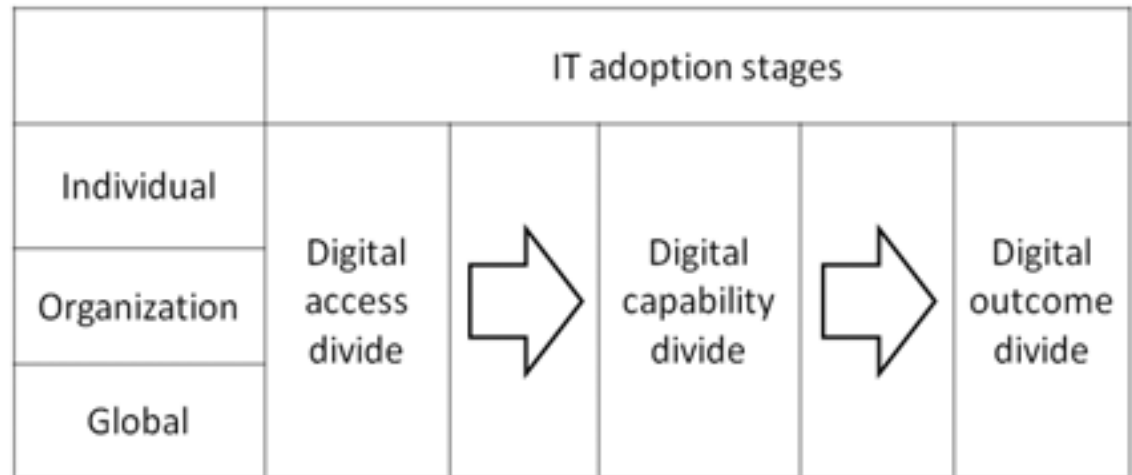
The number of dissertations about digital divide in Taiwan

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number	2	7	8	9	10	11	16	5	4	2

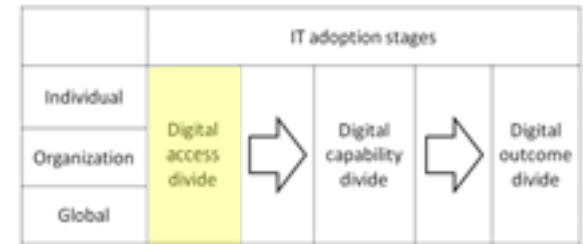
Conclusion → the problem is solved???????

# Figure I-1

- Wei, Teo, Chan and Tan proposed a framework which describes **three levels of digital divide** [WTC2011]
- Each level of the digital divide can be studied at the **individual**, the **organizational**, or the **country** level.

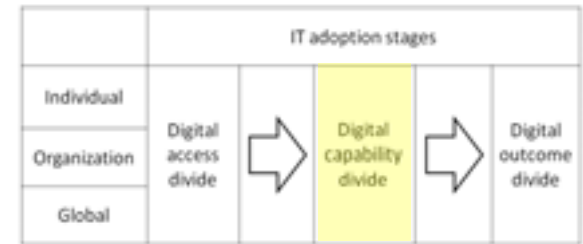


# Figure I-2



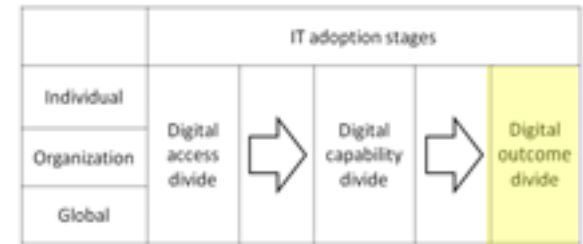
- The first level refers to the **inequality of access to IT** [DR2005]
  - such as access to computers in homes and schools
- typically described as the “**narrow sense**” of the digital divide [Fr2001]
- covers both **hardware access** as well as **usage of software**.

# Figure I-3



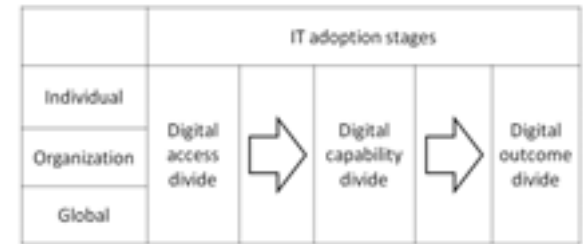
- The second level refers to the **inequality of IT capability**
  - It means “**the ability to use the technology**” [DR2005].
- consequence of the first-level digital divide and other contextual factors
- A narrow definition of the second level focuses on **abilities to find information online** [OECD2009].

# Figure I-4



- The third level refers to the **inequality of digital outcomes**.
- arises from the second-level digital divide and other contextual factors
- Examples of digital outcome divide include **differences in learning outcomes and productivity**.

# Figure I-5



- Most digital-divide studies in Taiwan have focused on the first and second level as the dependent variables, with individual, socioeconomic, or geographical factors as determinants.
- With the easing of access and literacy divide, researchers began to lose interest in the digital divide issue.
- But a theoretical account for the effects of the digital divide is still lacking.

# *Case Study*





# Research Design

- The ultimate goal of bridging digital divide was to enable each person to use information technology according to his/her **individual needs**.
- The focus was on the **process** of bridging the digital divide.
- A **rural community** was selected as the object of study.
- **Participant observation** was the main method of data collection.



# Site Selection

**Gueilin Community**  
**桂林社區**

外島地區



連江縣



金門縣



澎湖縣





# Selection Reason -1

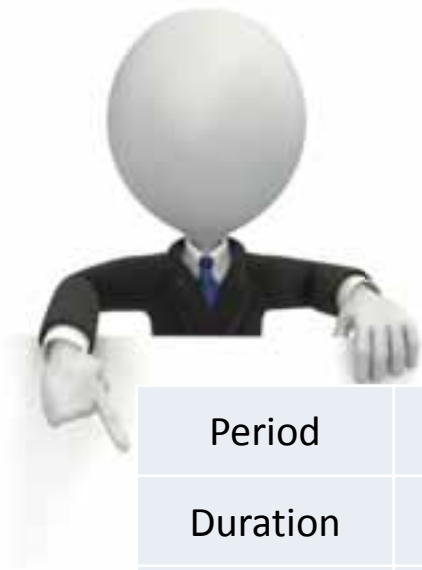
- Yunlin county's **computer and internet usage** almost ranked in **last place** in Taiwan's cities and counties.
- Gueilin is a **rural community**. Rural communities have almost all the factors leading to the digital divide.



# Selection Reason -2

- The researchers have established **a profound friendship** with the community residents, which made data collection much easier.





# Data Collection

Period	I	II	III
Duration	2000-2003	2004-2005	2006-2008
Method	interviews document review	interviews document review	participant observation interviews document review
Research Subject	Elementary school teachers community leaders	students (volunteers)	community residents



# Data analysis -1

- **Screen critical events**
  - help of **three experts** in digital divide research
  - Critical events were selected by the experts
  - Results were compared
  - Priorities were assigned to events
- Finally, a total of **31 key events** was chosen.

# 31 key events

[E1] September, 2000: Gueilin elementary school (GES) sets up a computer class.

[E2] 2001 – 2004: GES offers free computer courses for students' parents.

[E3] June, 2002: GES creates photo sites for graduates.

[E4] 2004 – 2005: Yuanpei University (YPU) organizes summer camps

[E17] August, 2005: Community residents spontaneously improve hardware and software for the community computer class.

[E18] August, 2005: A female student cannot attend the community computer course, because her mother in law considers computers not necessary for daily life.

[E19] August, 2005: Community leaders reject the Woman-Up project

## For example:

[E1] September, 2000: Gueilin elementary school (GES) sets up a computer class.

[E2] 2001 – 2004: GES offers free computer courses for students' parents.

[E16] August, 2005: The government supports the improvement of the computer network for the community computer class.

[E11] May, 2005: Community leaders decide to purchase a projector.

[E12] June, 2005: GES broadcasts documentary film in the graduation ceremony.

[E13] July, 2005: A community website is completed.

[E14] June, 2005: Professor Fang of YUST donates money to build a community computer classroom.

[E15] July – August, 2005: YPU starts with a free computer course for community residents.

[E16] August, 2005: The government supports the improvement of the computer network for the community computer class.

[E26] August 2006: Parents are concerned about Internet addiction problems.

[E27] February 2007: The community computer class is closed.

[E28] 2007 – 2008: When community leaders plan to apply for funding, they always request YPU students and teachers to help with videos and photos.

[E29] June, 2008: The ownership rate of computer equipment among GES students comes close to 90%.

[E30] September, 2008: Parents demand a safer digital environment.

[E31] October, 2008: Teachers at GES ask YPU for solutions to provide trust in information technology among parents.



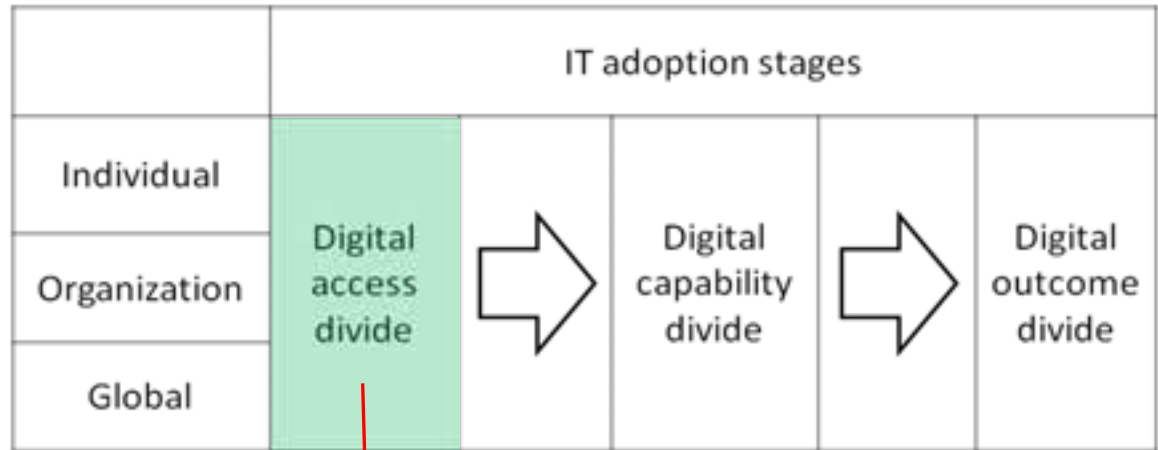
# Results -1

- The process of bridging digital divide followed the three-level framework by Wei, Teo, Chan and Tan [WTC2011].





# Results -2



**E1, E5, E7, E11, E14, E16, E17, E21, E23, E29 (10 events)**

## For example:

- [E5]** December, 2004: Yunlin University of Science and Technology(YUST) donates old computers to GES.
- [E14]** June, 2005: Professor Fang of YUST donates money to build a community computer classroom.
- [E16]** August, 2005: The government supports the improvement of the computer network for the community computer class.

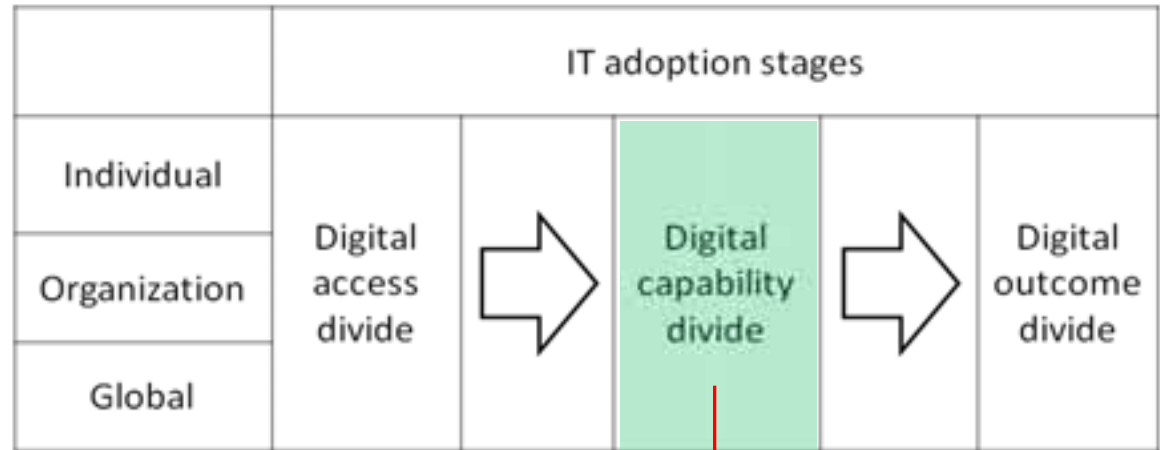
**[E11] May, 2005:**

Community leaders decide to purchase a projector.





# Results -3



**E2, E4, E6, E15(4 events)**

## For example:

- [E2]** 2001 – 2004: GES offers free computer courses for students' parents.
- [E6]** January, 2005: GES teachers spontaneously learn video editing and improve their skills in website creation.
- [E15]** July – August, 2005: YPU starts with a free computer course for community residents.

**[E4] 2004 – 2005:**

Yuanpei University (YPU) organizes summer camps at GES.



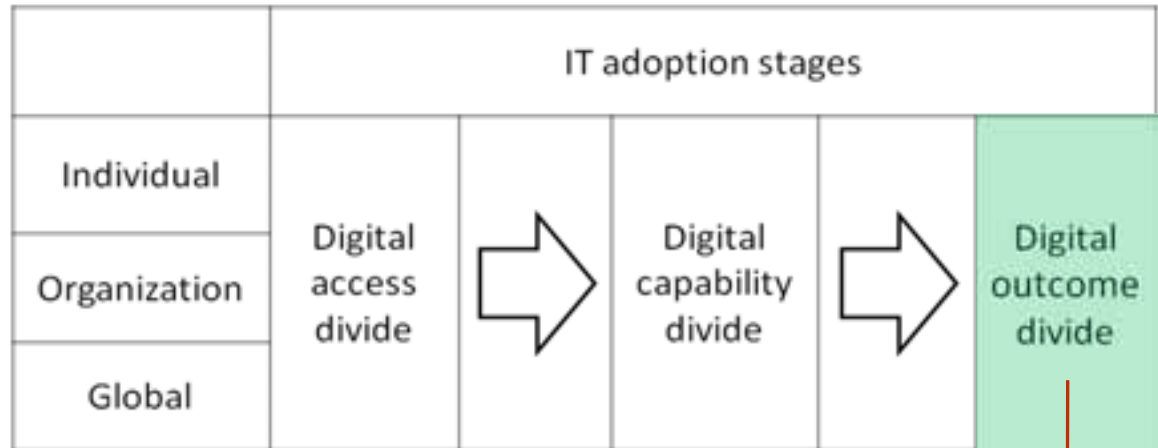
**[E15] July – August, 2005**

YPU starts with a free computer course for community residents.





# Results -4



E3, E6, E8, E9, E10, E12, E13, E22, E28 (9 events)

## For example:

**[E8]** April, 2005: Community leaders issue community newsletter.

**[E22]** January, 2006: YPU teachers and students use multimedia technology to support community leaders in their struggle for project budgets.

**[E28]** 2007 – 2008: When community leaders plan to apply for funding, they always request YPU students and teachers to help with videos and photos.

**[E22]** January, 2006:

YPU teachers and students use multimedia technology to support community leaders in their struggle for project budgets.





# Results -5

- There are still some events left:
  - **E18, E19, E20, E24, E25, E26, E27, E30, E31**

## For example:

- [E18]** August, 2005: A female student cannot attend the community computer course, because her mother in law considers computers not necessary for daily life.
- [E19]** August, 2005: Community leaders reject the Woman-Up project invitation from Microsoft and the government.
- [E26]** August 2006: Parents are concerned about Internet addiction problems.
- [E27]** February 2007: The community computer class is closed.
- [E30]** September, 2008: Parents demand a safer digital environment.
- [E31]** October, 2008: Teachers at GES ask YPU for solutions to provide trust in information technology among parents.



# Results -6

- The issues behind the events are:
  - How could community residents express their **information requirements**?
  - How could they achieve **trust in information technology**?

# Results -7

## @Information requirements

- The **government provided computers** and **trainings** to improve information literacy.
- But residents emphasized that **their daily life did not require the use of computers**, so they soon forgot their information skills.
- Results:
  - digital divide is not simply a matter of access, or empowering people to become proficient computer users
  - People need to **maintain these skills through constant involvement.**



# Results -8

## @Trust in information technology

- Adults thought that the use of computers is **unnecessary**
- they proposed that **their children should have the chance to use computers**
- Parents were worried about **Internet addiction, Internet crime, and misuse of social networks**
- They felt **they could not trust information technology,**
- They didn't want their children to be exposed to these risks.



# Cloud Computing



# Cloud Computing - 1

## Cloud computing and digital divide

- Cloud computing can provide an easy and inexpensive access to state-of-the-art IT technology, software and applications, which have not been available for developing countries or regions.
- Cloud computing also helps people develop their skills, by offering training tailored to their needs [st2011].



# Cloud Computing - 2

## Cloud computing and digital divide

- The NIST definition of cloud computing distinguishes between **private**, **public** and **community clouds** [NIST2011].
- **Community clouds** can provide **applications or e-learning modules** which are needed and helpful for community residents or children.
- A community cloud could establish **filters for internet access**, protecting children from internet crime or internet abuse and thus calming the worries of their parents.

# Cloud Computing -3

## Bridging digital access divide

- Cloud computing allows for inexpensive and less powerful client computers.
- Client computers can be shared, or used at Internet cafes or schools.
- One-Laptop-Per-Child initiative  
<http://olpc.org>



# Cloud Computing -4

## **Bridging digital capability divide**

- Providing e-learning modules and training appropriate for community residents

# Cloud Computing -5

## **Bridging digital outcome divide**

- Providing appropriate applications suited to the users' needs
- Facilitating cooperation between users on community projects
- Providing proxy functionality
  - Learning and working environment
  - Safe Internet access

# *Proposed Project*



# Proposed Project -1

- To implement cloud computing in the elementary school's fifth grade.
- There are 14 students in this class, they all live in small settlements scattered in the rural community.



# Proposed Project -1

- The **server** will be **run at the elementary school**, administrated by the class **teacher**.
- Parents only need to **spend a little money** to buy an inexpensive computer, and to get cheap internet access.
- Through this cloud service, with the help of the teacher, **students will get a chance to experience safe e-learning**, and **the worries of their parents should be reduced**.



# Q & A

Thank you for your  
attendance!

