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

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>2</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>16</td>
<td>5</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Conclusion → the problem is solved????????
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 1.2

- 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**.
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].
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**.
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
• 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
• 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

<table>
<thead>
<tr>
<th>Period</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>interviews document review</td>
<td>interviews document review</td>
<td>participant observation interviews document review</td>
</tr>
<tr>
<td>Research Subject</td>
<td>Elementary school teachers community leaders</td>
<td>students (volunteers)</td>
<td>community residents</td>
</tr>
</tbody>
</table>
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.


[E5] December, 2004: Yunlin University of Science and Technology (YUST) donates old computers to GES.


[E10] May, 2005: The drinking water for the Gueilin community was polluted as a result of illegal construction; YPU students help residents to make a short presentation video to fight for community residents’ rights.


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

[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 invitation from Microsoft and the government.


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


[E25] August, 2006: Community residents expect YPU to use information technology to solve their problems.

[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%.


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

For example:

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


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

[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 invitation from Microsoft and the government.
Results -1

• The process of bridging digital divide followed the three-level framework by Wei, Teo, Chan and Tan [WTC2011].
Results 2

For example:

[E5] December, 2004: Yunlin University of Science and Technology (YUST) donates old computers to GES.


[E16] August, 2005: The government supports the improvement of the computer network for the community computer class.
Results -3

For example:


Yuanpei University (YPU) organizes summer camps at GES.
[E15] July – August, 2005
YPU starts with a free computer course for community residents.
Results 4

<table>
<thead>
<tr>
<th>Individual</th>
<th>Digital access divide</th>
<th>Digital capability divide</th>
<th>Digital outcome divide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

For example:

[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.
[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?
@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**.
@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

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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 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.
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](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!

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