Living in a converged world - impossible without standards?

Reverse Standardization from Public E-health Service

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Think about convergence by an ecosystem and the business model from widely deployables.
Real Deployment: Portable Health Clinic

- Kyushu University (Japan) and Grameen Communications (Bangladesh) prototyped an affordable “portable clinic” and experimented in villages and cities, Bangladesh
  - Confirm functionalities and usability of the system
  - NICT(Japan) provides BAN*-based portable clinic functions for a large number of experimental uses

Original idea

BAN*: Body Area Network

To medical/healthcare devices

2.4GHz BAN board

400MHz BAN board
BAN: Key Component in Portable Health Clinic

Effective and no-mistake data retrieval for Portable Health Clinic and remote patient monitoring /assisted living

From ITU-T FG M2M enabled ecosystems: e-health report in April 2014

Saint Petersburg, Russian Federation, 3-5 June 2014
ITU Kaleidoscope 2014 - Living in a converged world - impossible without standards?
PORTABLE HEALTH CLINIC (PHC) IN BANGLADESH
AN AFFORDABLE, USABLE, SUSTAINABLE AND PREVENTIVE HEALTHCARE SYSTEM FOR UNREACHED PEOPLE

Categorization by the results of health checks by PHC

- Normal
- Subnormal; Brochure
- Abnormal; Telemedicine
- Serious ill; Telemedicine and visit hospital

"Triage"

Sensors and network which are easy to operate

Grameen healthcare lady

Disease Management Office Call Center (by doctors)

Remote-prescription

BAN Portable Health Clinic

BAN device

Associate

Coordinator

Sensor

Data

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BAN medical/healthcare Devices

- Android terminal + BAN
- BAN blood pressure with IHB
- BAN SpO2 sensor
- BAN waist/hip meter
- BAN contactless body temperature meter
- BAN height meter
- BAN weight meter
- (Plan) Vein authentication sensor
- BAN blood sugar meter
- (Plan) Non-invasive hemoglobin measurement device

- BAN-PHC works without power supply during health checks

Grameen healthcare lady
BAN-PHC procedure

Remote call center

Database

Point-of-care medical examination, categorization, and telemedicine

Examinees

Remote diagnosis and prescription

Medical certificate and prescription

Use measurement devices for automatic categorization

Non-invasive medical BAN devices

Blood pressure, blood, urine, etc.

Blood test

Urinalysis

15 items
<table>
<thead>
<tr>
<th></th>
<th>Green</th>
<th>Yellow</th>
<th>Orange</th>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waist</strong></td>
<td>Male: &lt;90cm</td>
<td>≧90cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female: &lt;80cm</td>
<td>≧80cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Waist/Hip Ratio</strong></td>
<td>Male: &lt;0.90</td>
<td>≧0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female: &lt;0.85</td>
<td>≧0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Body Mass Index (BMI)</strong></td>
<td>&lt;25</td>
<td>25≦</td>
<td>&lt;30</td>
<td>30≦</td>
</tr>
<tr>
<td><strong>Blood Pressure (mmHg)</strong></td>
<td>&lt;130 mmHg</td>
<td>130≦</td>
<td>&lt;140 mmHg</td>
<td>140≦</td>
</tr>
<tr>
<td></td>
<td>&lt;85 mmHg</td>
<td>85≦</td>
<td>&lt; 90 mmHg</td>
<td>90≦</td>
</tr>
<tr>
<td><strong>Blood Sugar</strong></td>
<td>&lt;100mg/dl</td>
<td>100≦</td>
<td>&lt;126mg/dl</td>
<td>126≦</td>
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<tr>
<td><strong>Postprandial Blood Sugar</strong></td>
<td>&lt;140mg/dl</td>
<td>140≦</td>
<td>&lt;200mg/dl</td>
<td>200≦</td>
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<tr>
<td><strong>Urine test</strong></td>
<td>Urine Protein</td>
<td>-</td>
<td>±</td>
<td>≧+</td>
</tr>
<tr>
<td></td>
<td>Urine Sugar</td>
<td>-</td>
<td>±</td>
<td>≧+</td>
</tr>
<tr>
<td></td>
<td>Urobilinogen</td>
<td>±</td>
<td>±</td>
<td>≧+</td>
</tr>
<tr>
<td><strong>Pulse Ratio</strong></td>
<td>60≦</td>
<td>&lt;100 bpm (beat per minute)</td>
<td>50≦</td>
<td>&lt;60 bpm</td>
</tr>
<tr>
<td></td>
<td>100≦</td>
<td>&lt;120</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Arrhythmia</strong></td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td>None</td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><strong>Body Temperature</strong></td>
<td>&lt;37℃</td>
<td>37℃≦</td>
<td>&lt;37.5℃</td>
<td>37.5℃≦</td>
</tr>
<tr>
<td><strong>SpO2</strong></td>
<td>≧96%</td>
<td>93≦</td>
<td>&lt;96%</td>
<td>90≦</td>
</tr>
<tr>
<td><strong>Hemoglobin</strong></td>
<td>≧12g/dl</td>
<td>10≦</td>
<td>&lt;12g/dl</td>
<td>8≦</td>
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</tbody>
</table>
Results of Telemedicine by PHC in FY2013

- First time visitors > 8500 in FY2012, > 6300 in FY2013
- Visitors > 1400 in both FY2012 and 2013

Visitors n=7794

Telemedicine (n=3080) → Ask to visit 2 months later

Emergent (5%) → Health Care Instruction

Affected (35%) → Healthy (9%)

Caution (51%)

n=7794

2nd visitors, n=709 (All the 2nd health check up is not finished)

At the first visit

Healthy (5%)

Caution (45%)

61% follow up exam. In FY2012

2 months later

n=709

Need sustainable ecosystem and business model
PHC Business Model

- A business model expects clear roles and relevance among companies involved in business
- May not sufficient to maintain

![Diagram of PHC Business Model with roles and service management systems.]

- System and service management (System maintenance, Healthcare lady support)
  - Medical doctor (Remote diagnoses and prescription)
  - Researcher (Epidemiologic study using big data)
  - Entrepreneur for employees
  - Microfinance
  - Healthcare lady
  - Village people
Ecosystem of M2M-enabled BAN-PHC

- M2M services provide pre-processing of collected and accumulated data for diagnosis, epidemiological research and so on
- BAN devices under M2M devices provide medical device evaluation
M2M-enabled BAN-PHC Business Model

- New business domain can be inserted
  - One example is device manufacturers
  - Many candidates to use automatic M2M communication with no intervention of medical/healthcare staffs

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**Device manufactures**
(Medical/healthcare device evaluation)
- Reduce re-certification
- Improve algorithm
- Consistent data retrieval
- Use count for durability

**Researchers**
Epidemiologic study using big data

**Medical doctor**
(Remote diagnoses and prescription)

**System and service management**
(System maintenance, Medical ready support)

**Entrepreneur for employees**

**Healthcare lady**

**Village people**
Open BAN Standards

MBAN (Medical Body Area Network) international standards are essential for qualified eHealth.

- **Medical frequency band** for quality of service
- **Low-power** consumption in modulations
- **Strict security** enforcement
- Top-priority data transfer for **emergency data**
- Ensure **secure SAR** (Specific Absorption Ratio) level

- **IEEE802.15.6** Narrow Band [US, JP, EU, 400MHz, 800MHz, 900MHz, 2.36GHz, 2.4GHz]
- **IEEE802.15.4j** [US, 2.36GHz]
- **IEEE802.15.4n** [CN, 200MHz, 400MHz, 600MHz] Coming up soon
Conclusion

- Reverse Standardization “Enablers”
  - Personal Health Clinic (PHC)
    - Practical experiences and results in developing country
  - BAN technology, especially MBAN
    - Can use in fields not only in hospitals/care houses because of small-factor and battery-operable devices
    - Can plug-in new tech. sensors following simple std. interface
  - M2M technology
    - Create new business roles in business model

Increase BAN-PHC uses with a sustainable M2M-based business model and help e-health standards convergence.
Thank you