Design Metaphor to Improve Interface Usability for Paddy Farmers in Malaysia Using User-Centered Approach

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Introduction

Theories of Metaphor

- A representation of **object** and **situation** that have **meaning** and comparable to real thing to **convey** the message to people. [8]
- Facilitate in making **communication** more direct and **effective** for particular user communities.
- Convey visually through **words** and **images**, or through **audio** or **tangible** means.

Introduction (cont..)

- The use of information communication and technologies may also have a big impact on socio-economic development of poor communities in developing countries [9, 11, 15].

- Mobile technology has become widely spread among the farmer population [4] including paddy farmers [2] in Malaysia.

- Most possessed and popular ICT tools among the agriculture community are mobile phone (97.3%), follows by computer (54.0%) and tablet (5.6%). [5]

Related Works

- Discovered the study of design metaphor are more incline of using office metaphors where it encompasses of computer system design metaphor. [6,7,8]
- Related to functions or tasks of the computer system. In addition, the metaphors are designed for those who have high literacy on the computer itself.
- Found out that the semi-illiterate population has difficulty to understand the design metaphors and preferred concrete metaphor rather than abstract metaphor. [3,9,16]
- Users with low-level literacy would favor iconic user interface. [15]
- Claim supported by many other researchers [6,9,16] that discovered literacy and computer skills of their users to improve the usability of the system interface using design metaphors.

Related Works (cont..)

- Studies on design metaphors have been conducted widely in other countries and in agriculture sector. However it is unfortunately not being discovery much in Malaysia.
- There were only two studies [13,14] which discussed metaphors in Malaysian setting. In [14] the study discussed metaphors involvement in multiracial setting and in [13] the study used to incorporate Islamic metaphors in desktop design for Muslim users in Malaysia.
- Presently, there are no study design metaphors in Malaysia agriculture context or any study that addresses design metaphors for paddy farmers in Malaysia.

Motivation & Project Background

Motivation

- ICT-Based Agriculture Flagship Blueprint of the Malaysia Government. [12] *(MOSTI, 2014).*
- Government initiative to prepare agriculture stakeholders in Malaysia with ICT knowledge and technology facilities whereby Agro Intelligence System (AIS) is hosted. [10] *(MOA, 2014)*
- **AIS** - to support as well as manage the information on agriculture program and can be accessed on various platform be it mobile devices, personal computer and kiosk. [1]
- Targeted for farmers, MoA Agencies, other related agencies and industrial companies

Motivation & Project Background

- Based on empirical study in [2], a farming diary mobile app for the paddy farmers in Malaysia is developed.
- The application designed is reflected to the farmers' agricultural activities as well as adopted the design metaphor guidelines.
- The application users are semiliterate paddy farmers that have low- to semi-literacy ICT skills and have little understanding of the usage of design icon of their mobile phone.

Metaphors Design Guidelines

Element	Description
Language	• Use language of the population. For example, Malay paddy farmers could only understand Malay instruction, menu, label etc. Icon with textual integration is also not preferable especially if the language could not be understood by them.
Activity	• Represent relevant farming activities. For example, paddy farmers' main activities include sowing, seeds, pesticides spraying, rising water, fertilising, rouging, receding water and harvesting.
Instrument	• Represented relevant farming instruments, machines and appliances. For example, paddy farmers use sickle for roughing activity.
Richness	• Represent the design metaphor with rich source of language, meaning, values, and cultural references. For example, instruments, machinery and appliances use by the paddy farmers in Malaysia are not exactly the same with other countries e.g. India, Indonesia etc.
Suitability	• Design metaphor offers effective solution, functionality and could accommodate for future enhancements. For example, a pictorial of a sack, which was taken from overseas application to indicates sowing seeds activity could not be understood by the local paddy farmers because the icon and functionality does not map properly.
Fun & Interesting	• Metaphor should be understandable and enjoyable. There should be no distraction and frustration feeling towards the design metaphors
Originality	• Metaphor must be real and can relate to the cultural behaviour and representation of specific domain tasks as well as environment.
Adaptability & Transferability	• Metaphor should be flexible and easily adapted in other agriculture domains as well as expanded into other cultural settings.
Colour Choices	• Metaphor colour selection has to reflect the domain theme appropriately. For example, paddy farmers mostly feel comfortable with green and light brown colours interfaces.

Seven Design Metaphors Represent Paddy Farming Activities

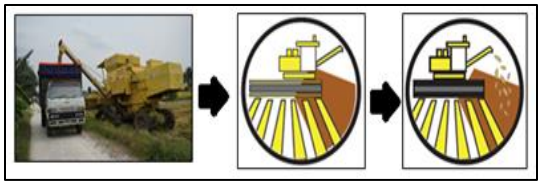


Figure 1. Design metaphor for harvesting

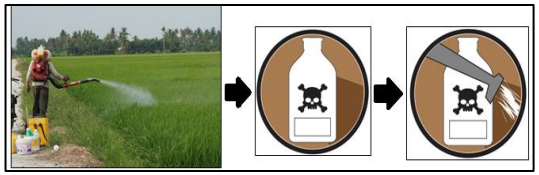


Figure 2. Design metaphor for pesticide spraying

Figure 3. Design metaphor for rouging activity

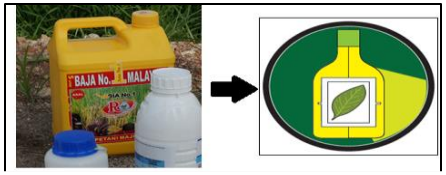


Figure 4. Design metaphor for fertilizing activity

Figure 5. Design metaphor for ‘Karah Daun’ paddy illness.

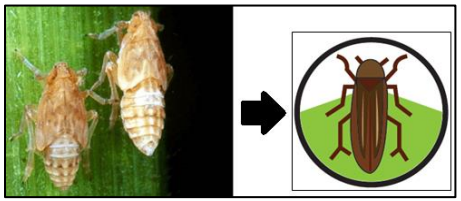


Figure 6. Design metaphor for pesticide ‘Bena Perang’.

Figure 7. Design metaphor for sowing seeds activity.

Figure 8. Design metaphor for rising water activity.

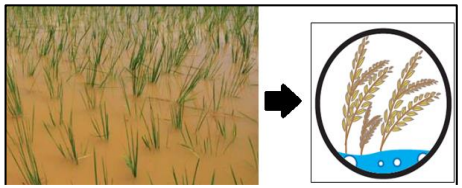


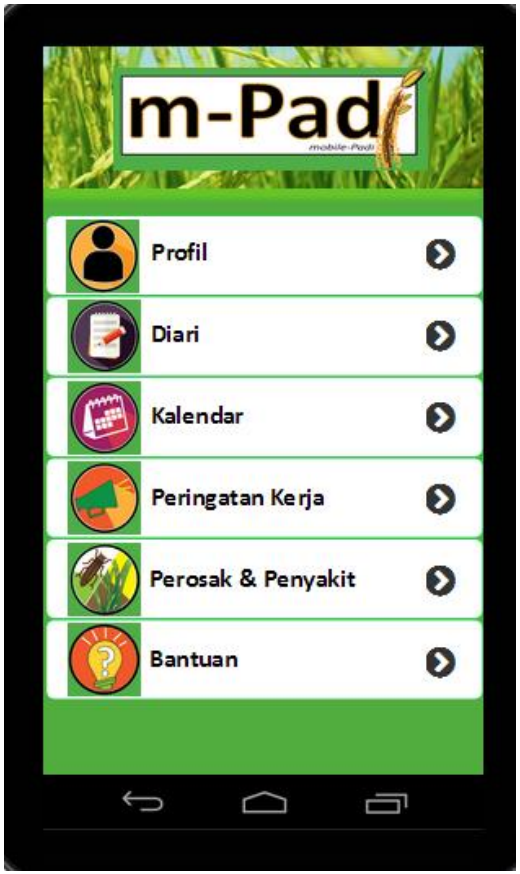
Figure 9. Design metaphor for receding water

The Prototype

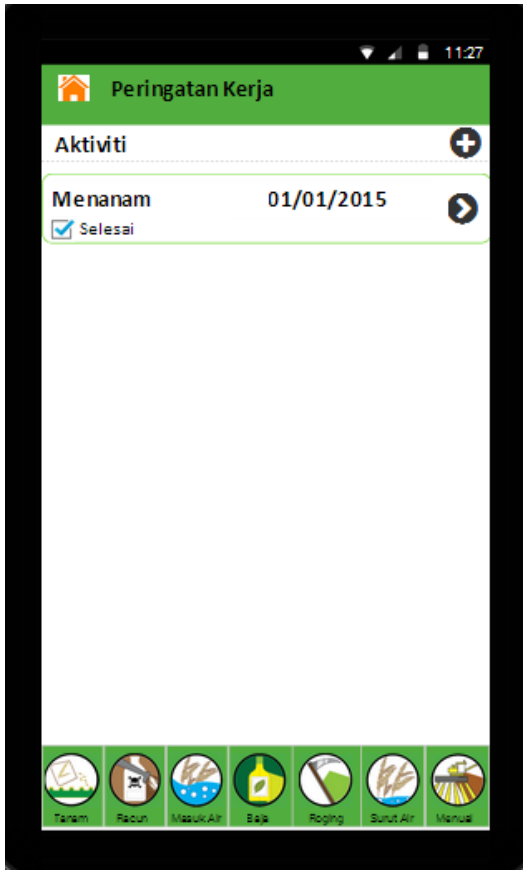
- **System Requirements for Agriculture Domain**

Feature	Description	Priority
Diary	• To record paddy farming activities based on season and activities	High
Calendar	• To record details and dates (start and end dates) for specific farming activities.	High
Work reminder	• To record and identify activities that need to be performed during farming seasons and worker who involve/perform the activity.	High
Information on pesticides and crop illness	• To provide detail descriptions of pesticides and types of illness with pictures.	Medium
Profile	• To record the farmer personal details	Low
Help	• To provide user guide to the farmers	Low

The Prototype (cont..)



(a)



(b)

Screen Interfaces of m-Padi Utilising the Developed Design Metaphors
(a) home screen (b) work reminder screen

Result and Discussion

- Four categories need to be evaluated on design metaphor in m-Padi application system usability, appearance of system, metaphor design and overall acceptance.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
System Usability	5	1.08	2.23	1.6154	.42829	.183	.348	.913	.559	2.000
Appearance of System	5	1.14	1.57	1.3429	.21665	.047	.315	.913	-3.081	2.000
Metaphor Design	5	1.13	1.88	1.5000	.26517	.070	.000	.913	2.000	2.000
Overall Acceptance	5	1.20	2.00	1.6000	.35355	.125	.000	.913	-2.608	2.000
Valid N (listwise)	5									

Table 1: Desrciptive Statistics for Four Categories of Mean and Standard Deviation

Conclusion

- User-centered approach provides an accurate design decision to users which find usable of the system.
- The crucial part is to elicit the requirements that user required for specific functions and needs.
- Deeper understandings gained are used to derive a set of requirements of metaphors designs that address the local farmers' characteristics e.g. literacy, ICT skills, experience, language, culture, tasks and instrument, adaptability.
- Appropriate design metaphors could improve user interface design while minimizing intervention for the farmers using agriculture application systems that are introduced to farmers.
- Intends to use the design metaphor guidelines to develop a set of design metaphors which going to be adopted on appropriate application contexts for the paddy farmers i.e. paddy diary
- Expected to assists software developers and designers to design effective design metaphors for the intended population e.g. farmers/paddy farmers in Malaysia.

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