ORIGINAL RESEARCH

Knowledge Management-based Classification Method for Disability-Inclusive Business

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ABSTRACT

Purpose: *This study provides evidence to clarify disability inclusiveness in activities of rural business. As an alternative to the analysis method that deals with disability-inclusiveness as a vague concept, knowledge management principles were applied to propose a classification method for disability-inclusive business as an emerging concept at the community level.*

Methods: *The analysis focuses on: 1) productivity of entrepreneurs with disabilities; 2) knowledge of entrepreneurs with disabilities; and 3) understanding of customers. A total of 50 entrepreneurs with disabilities in micro and small businesses in Southeast Asia were identified in this context. Data were collected and analysed according to a story-based knowledge management approach and value chain analysis. Fuzzy logic analysis which exploited domain ontology was utilised to convert knowledge from tacit to explicit, in line with knowledge management principles. A numeric weight based on linguistic variables became available to describe each disability-inclusive business case, as well as the arrangements of fuzzy sets.*

Results: *Out of 50 cases, 7 were classified as fully disability-inclusive while 14 were classified as not disability-inclusive. Productivity of entrepreneurs with disabilities in 3 elements of the value chain, namely procurement, product/service development and distribution, was observed to be significant. The Study showed that disability-related knowledge of entrepreneurs with disabilities could contribute to business performance according to the key success factors to enhance added value. Two elements of the value chain, namely sales/marketing and customer service, are not the decisive factors to define and clarify disability-inclusiveness.*

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Conclusion: *Settings in Southeast Asia are diverse and at varying stages of economic and social development; hence the environment which promotes the disability-inclusive business concept may be inconsistent. Micro and small-scale rural businesses were tackled as a first step to evaluate comparative efforts of each case of disability-inclusive business from the viewpoint of entrepreneurs with disabilities. Therefore, in highlighting the differences, it is recommended that further research should seek to apply weighting factors depending on the individual size, contents and scale of major business areas.*

Key words: *Disability-inclusive business, fuzzy logic, knowledge management.*

INTRODUCTION

According to the livelihood component of the Community-Based Rehabilitation (CBR) Guidelines, "self-employment" is a term applied to economic activities in both the formal and informal economies which are owned, operated and managed by an individual or a group (WHO, UNESCO, ILO, & IDDC, 2010). The CBR Guidelines noted three broad categories as i) income-generating activities; ii) small and medium enterprises; and iii) self-help groups and group enterprises (WHO, UNESCO, ILO, & IDDC, 2010). Indeed, the major local and international NGOs working for disability and academic institutes have referred to a variety of livelihood activities by persons with disabilities in developing countries. On one hand, there are many research papers that have addressed significant contributions of the business sector, such as the initiatives of Corporate Social Responsibility (CSR) for persons with disabilities and their organisations in rural areas. However, there was no specific strategy on disability and business, unlike the "green business" strategy in the environment field.

Against this background, the term "disability-inclusive business" was initially raised through the Senior Officials' Meeting on South-to-South Cooperation on Disability organised by the Asia-Pacific Development Centre on Disability (APCD) and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) at the United Nations Convention Centre in Bangkok, Thailand, in August 2010 (APCD, 2010). Through a series of discussions to elaborate the concept, the definition of disability-inclusive business was adopted as "an enterprise that has a positive impact on disability-friendly environment, communication, attitude, policy and regulation, taking into consideration the business model where its activities comply with the following criteria: 1) It incorporates the principles of accessibility into each of its business aspects; 2)

It offers disability-friendly products, communication and services that replace those which are not disability-friendly; and, 3) It has made a commitment to disability principles according to the United Nations Convention on the Rights of Persons with Disabilities in its business policies" (APCD, 2012).

Following this progress, the United Nations ESCAP recognised the concept of disability-inclusive business through a regional policy paper on disability and development called "Incheon Strategy to Make the Right Real, 2013-2022" (ESCAP, 2012). In collaboration with the United Nations ESCAP, APCD is requested to encourage private sector engagement in disability-inclusive business that promotes disability-friendly products, services, employment opportunities and entrepreneurship development (ESCAP, 2012). In terms of both the value-addition inherent to ensure enabling environments for persons with disabilities in the business context, and the increased market share for business in the delivery of disability-friendly products and services, the concept of disability-inclusive business is expected to extend beyond an advocacy-based approach to an enhanced business model. Therefore, disability-inclusive businesses could be viewed as those that incorporate and extend opportunities and services to persons with disabilities, and positively overcome the conventional barriers they face.

At the same time, it is necessary to clarify disability-inclusiveness in the promotion of the disability-inclusive business concept, assuming that a disability-friendly environment can prove beneficial to a company's bottom line. While most business cases perceive disability as the topic of Corporate Social Responsibility (CSR), there is no clear method to understand, analyse and promote disability-inclusive business. Available disability-related information materials have not addressed knowledge that persons with disabilities could apply to tackle obstacles and promote businesses in an inclusive way. Moreover, there is no model that can demonstrate disability-inclusiveness, though an analysis is needed for persons with disabilities to apply knowledge into business. In collaboration with knowledge workers, the clarification of disability-inclusiveness is needed to elaborate the viewpoints of productivity, understanding and knowledge in the context of disability and business.

In line with this, the current study sought to apply the principles of knowledge management to explore the topic of disability-inclusive business pertaining to rural community settings in Southeast Asia. It also aimed to propose a classification method for further discussion and consideration.

Objective

The study aims to answer two questions:

1) What knowledge and other key elements are available from the identified disability-inclusive business cases by entrepreneurs with disabilities at the community level in Southeast Asia?

2) How can fuzzy logic be applied to clarify disability-inclusiveness in the business context in rural settings in Southeast Asia?

METHOD

Story-based Knowledge Management

Case study is one technique of qualitative research. While case study methods involve an in-depth examination of a single instance rather than of many samples, the distinction between tacit and explicit knowledge suggests four basic patterns: socialisation, externalisation, combination and internalisation: SECI model (Nonaka, 1994). For creating and managing knowledge in any community practice, Story-based Knowledge Management is one approach which indicates that the process of knowledge management can be documented as a story (APCD, 2010), and illustrate into knowledge creation, validation, production and distribution according to SECI model (Nonaka & Konno, 1998). It provides a systematic way of observing the case, collecting data, analysing information, and reporting.

Study Population and Sampling Method

In-depth interviews were conducted for data collection and analysis. Through field visits, 66 persons with disabilities were contacted, who were engaged in small businesses in communities in rural areas of Southeast Asia. A total of 50 cases were selected for further study and 16 were omitted as they did not comply with the entrepreneurship criteria.

Entrepreneurship Criteria:

- Business Role: Entrepreneurs who play the roles of employers, own-account workers, members of producers' cooperatives or contributing family workers as defined by the ICSE-93.

- Sustainability: Entrepreneurs who run their business on a regular basis.
- Income Source: Entrepreneurs who get remuneration that is directly dependent upon the profit derived from their own business.

All interviews were conducted on a voluntary basis. The face-to-face interviews started with basic information about business and were followed by the semi-structured interviews to analyse the disability-inclusive business elements.

Disability-Inclusive Fuzzy Logic Analysis Tool

Recently, the fuzzy logic technique has been applied to a variety of topics in modelling of uncertainties, vagueness, impreciseness and the human thought process (Dahal et al, 2005).

In this study, fuzzy logic was utilised to classify disability-inclusive business by clarifying what disability-inclusiveness is. With the aim of dealing with "disability-inclusiveness" as a fuzzy, imprecise or vague concept, the "Disability-Inclusive Fuzzy Logic Analysis Tool" has been proposed, to ensure a perspective from all the target cases and to demonstrate the breadth of the study. A computer application software called "Matlab" was utilised for fuzzy logic analysis to respond to a linguistic and interactive environment for numerical computation and visualisation.

The unique point of this study is to classify disability-inclusiveness in business, and to establish that productivity of entrepreneurs with disabilities is significant to business, given the condition that either knowledge of entrepreneurs with disabilities or understanding of customers can also be observed based on 5 components of the value chain which includes 1) procurement; 2) product/ service development; 3) distribution; 4) sales/marketing; and, 5) customer service. Mamdani's (1977) method was chosen for fuzzy interference with direct method. Fuzzy Linear transformation function applied a linear function was set in the 0 to 100 range.

In line with the SECI model (Nonaka, 1994), the method to classify disability inclusiveness is presented in Figure 1.

Figure 1: SECI Model and Process of Analysis

Socialisation	-Group 1 (25 cases) -Fuzzy Set 1: 5 Elements of Value Chain with 10 observations/ questions
Externalisation	-Group 1 (25 cases) -Fuzzy Set 2: 3 Elements of Value Chain with 6 observations/ questions
Combination	-Group 2 (25 cases) -Fuzzy Set 2: 3 Elements of Value Chain with 6 observations/ questions
Internalisation	-Group 1 and 2 (50 cases) -Fuzzy Set 2: 3 Elements of Value Chain with 6 observations/ questions

1) Socialisation

50 cases were randomly divided into 2 groups. Group 1 comprised 25 cases of entrepreneurs who were selected to classify productivity, knowledge and understanding by classification of elements of the value chain: 1) procurement; 2) product/service development; 3) distribution; 4) sales/marketing; and, 5) customer service as fuzzy set 1.

The classification of productivity could be represented with the following 243 input fuzzy sets:

- "Productivity-high" if availability of productivity of entrepreneurs with

disabilities in at least 3 out 5 elements of value chain could be observed (51 fuzzy sets).

- "Productivity-medium" if availability of productivity of entrepreneurs with disabilities in 1 or 2 out of 5 elements of value chain could be observed (160 fuzzy sets).
- "Productivity-low" if availability of productivity of entrepreneurs with disabilities in value chain could be observed at the level of "somewhat" or "not at all" (32 fuzzy sets).

The classification of knowledge could be represented with the following 243 input fuzzy sets:

- "Knowledge-profound" if availability of knowledge of entrepreneurs with disabilities in at least 3 out 5 elements of value chain could be observed (51 fuzzy sets).
- "Knowledge-medium" if availability of knowledge of entrepreneurs with disabilities in 1 or 2 out of 5 elements of value chain could be observed (160 fuzzy sets).
- "Knowledge-superficial" if availability of knowledge of entrepreneurs with disabilities in value chain could be observed at the level of "somewhat" or "not at all" (32 fuzzy sets).

2) Externalisation

The sales/marketing element and customer service element could not be observed significantly in productivity, knowledge and understanding, so the above-mentioned elements were removed from the classification. For Group 1 of entrepreneurs with disabilities, the 3 classification elements included 1) procurement; 2) product/service development; and, 3) distribution as fuzzy set 2.

The classification of productivity could be represented with the following 27 input fuzzy sets:

- "Productivity-high" if availability of productivity of entrepreneurs with disabilities in at least 2 out of 3 elements can be observed (7 fuzzy sets).
- "Productivity-medium" if availability of productivity of entrepreneurs with disabilities in 1 out of 3 elements of value chain can be observed (11 fuzzy sets).

- "Productivity-low" if availability of productivity of entrepreneurs with disabilities in value chain can be observed at the level of "somewhat" or "not at all" (9 fuzzy sets).

The classification of knowledge could be represented with the following 27 input fuzzy sets:

- "Knowledge-profound" if availability of knowledge of entrepreneurs with disabilities in at least 2 out of 3 elements of value chain can be observed (7 fuzzy sets).
- "Knowledge-medium" if availability of knowledge of entrepreneurs with disabilities in 1 out of 3 elements of value chain can be observed (11 fuzzy sets).
- "Knowledge-superficial" if availability of knowledge of entrepreneurs with disabilities in value chain can be observed at the level of "somewhat" or "not at all" (9 fuzzy sets).

The classification of understanding could be represented with the following 27 input fuzzy sets:

- "Understanding-deep" if availability of disability-related understanding of customers in at least 2 out 3 elements of value chain can be observed (9 fuzzy sets).
- "Understanding-medium" if availability of disability-related understanding of customers in 1 out of 3 elements of value chain can be observed (11 fuzzy sets).
- "Understanding-shallow" if availability of disability-related understanding of customers in value chain can be observed at the level of "somewhat" or "not at all" (9 fuzzy sets).

Priority was given to productivity. The classification of disability-inclusive business could be represented with the same 27 output fuzzy sets: as in 'socialisation'

- "Fully disability-inclusive" if "productivity-high", "knowledge-profound" and "understanding-deep" (1 fuzzy set).
- "Intensive disability-inclusive" if "productivity-high" and either "knowledge-profound" or "understanding-deep" (4 fuzzy sets).
- "Somewhat disability-inclusive" if "productivity-high" and either

"knowledge-medium/superficial"; or, "understanding-medium/shallow" "productivity-medium" and either "knowledge-profound/medium/superficial" or "understanding-deep/medium/shallow" (13 fuzzy sets).

- "Slightly disability-inclusive" if "productivity-low" and either productivity-low" and "knowledge-profound/medium/superficial" or "understanding-deep/medium/shallow" (8 fuzzy sets).
- If "productivity-low" and "knowledge-superficial" and "understanding-shallow" then "not disability-inclusive" (1 fuzzy set).

3) Combination

Group 2 consisted of the other 25 entrepreneurs with disabilities, to check feasibility of the disability-inclusive business classification. The 3 classification elements still included 1) procurement; 2) product/service development; and, 3) distribution as fuzzy set 2. The classification of productivity, knowledge, understanding and disability-inclusiveness remained the same as for the externalisation stage.

4) Internalisation

The 50 entrepreneurs with disabilities were the 25 entrepreneurs from Group 1 and the 25 entrepreneurs from Group 2, so as to compare the 2 groups of samples and the total samples. The 3 classification elements still included 1) procurement; 2) product/service development; and, 3) distribution. The classification of productivity, knowledge, understanding and disability-inclusiveness remained the same as for the externalisation stage.

Ethical Approval

The study protocol was approved by the Research Committee, College of Arts, Media and Technology, Chiang Mai University, Thailand.

RESULTS and DISCUSSION

50 sets of documentation which complied with the entrepreneurship criteria, namely 1) business role; 2) sustainability; and, 3) income source, covered 8 entrepreneurs from Cambodia (16%), 6 entrepreneurs from Indonesia (12%), 7 entrepreneurs from Lao PDR, 6 entrepreneurs from Myanmar (12%), 6 entrepreneurs from the Philippines (12%), 8 entrepreneurs from Thailand (16%) and 9 entrepreneurs from Vietnam (18%).

The productivity, knowledge and understanding scores for fuzzy set 1 included all 5 components: 1) procurement; 2) product/service development; 3) distribution; 4) sales/ marketing; and, 5) customer service. The procurement, product/service development, distribution of productivity, knowledge and understanding could be observed significantly in both Group 1 and Group 2 of entrepreneurs with disabilities.

The averages of availability of procurement, product/service development, distribution, sales/ marketing and customer service of productivity of entrepreneurs with disabilities in Group 1 were used to set parameters of membership function for fuzzy set 1 as presented in Table 1.

Table 1: Average of Availability of Productivity, Knowledge and Understanding

	Procurement	Product/Service Development	Distribution	Sales/ Marketing	Customer Service
Productivity	40.2	68.0	29.6	17.8	10.1
Knowledge	40.2	62.6	28.2	14.4	12.8
Understanding	21.6	29.2	20.8	3.2	7.6

It showed that entrepreneurs with disabilities were active or it was feasible for them to work in these functions. As a result, the fuzzy set 2 included only 3 significant components: i) procurement, ii) product/service development, and, iii) distribution.

The availability of product/service development component was ranked highest in productivity, knowledge and understanding in all countries in both Groups 1 and 2 of entrepreneurs with disabilities. The productivity in procurement component could be observed more significantly than in the distribution component, except in Indonesia.

Classification of Productivity of Entrepreneurs with Disabilities

The averages of availability of procurement (40 scores), product/service development (68 scores), distribution (30 scores), sales/marketing (18 scores) and customer service (10 scores) of entrepreneurs with disabilities in Group 1 were used to set the parameter of membership function of productivity for fuzzy set 1. The fuzzy set 1 classified 7 cases (28%) as medium productivity, 7 cases (28%) as high productivity and 11 cases (44%) as low productivity among entrepreneurs with disabilities of Group 1.

The parameter of membership function of fuzzy set 2 was set by the averages of major value chain components including procurement (40 scores), product/service development (68 scores), and distribution (30 scores). The fuzzy set 2 classified 3 cases (12%) as medium productivity, 10 cases (40%) as high productivity and 12 cases (48%) as low productivity among entrepreneurs with disabilities of Group 1.

For Group 2 of entrepreneurs with disabilities, the fuzzy set 1 classified 8 cases as medium productivity, 8 cases as high productivity and 9 cases as low productivity. With the fuzzy set 2, the number of medium productivity cases decreased to 3 (12%) and the number of high productivity and low productivity cases increased to 12 (48%) and 10 cases (40%), respectively.

For all entrepreneurs with disabilities with the fuzzy set 2, the number of medium productivity decreased from 15 cases (30%) to 6 (24%); while, high and low productivity increased to 22 cases (44%).

The components of fuzzy set 2 illustrated clearer classification of productivity between high and low as shown in Table 2.

Table 2: Classification of Productivity of Entrepreneurs with Disabilities

	Productivity Classification by Fuzzy Set 1			**Productivity Classification by Fuzzy Set 2**		
	High	**Medium**	**Low**	**High**	**Medium**	**Low**
Group 1	7	7	11	10	3	12
Cambodia	0	0	4	0	0	4
Indonesia	1	2	0	1	2	0
Lao PDR	0	2	2	0	1	3
Myanmar	1	0	2	1	0	2
Philippines	0	2	1	1	0	2
Thailand	3	0	1	3	0	1
Vietnam	2	1	1	4	0	0
Group 2	8	8	9	12	3	10
Cambodia	1	1	2	0	1	3
Indonesia	1	2	0	1	0	2
Lao PDR	0	2	2	1	0	2
Myanmar	1	0	2	1	0	2
Philippines	0	2	1	0	2	1
Thailand	3	0	1	4	0	0
Vietnam	2	1	1	5	0	0
Groups 1 & 2	15	15	20	22	6	22

Classification of Knowledge of Entrepreneurs with Disabilities

The parameters of membership function of productivity for fuzzy set 1 comprised the averages of availability of procurement (40 scores), product/service development (63 scores), distribution (28 scores), sales/marketing (14 scores) and customer service (13 scores) of entrepreneurs with disabilities of Group 1. The fuzzy set 1 classified 11 cases (22%) as medium knowledge, 22 cases (44%) as superficial knowledge and 17 cases (34%) as profound knowledge.

The parameter of membership function of fuzzy set 2 was set by the averages of major value chain components including procurement (40 scores), product/service development (63 scores), and distribution (28 scores). The fuzzy set 2 classified 1 case (4%) as medium knowledge, 11 cases (44%) as profound knowledge and 13 cases (52%) as superficial knowledge among entrepreneurs with disabilities of Group 1.

For entrepreneurs with disabilities of Group 2, the fuzzy set 2 did not affect classification of knowledge, which included 4 medium knowledge cases, 10 profound knowledge cases and 11 superficial knowledge cases. For all entrepreneurs with disabilities with the fuzzy set 2, the number of medium knowledge cases decreased from 11 (22%) to 5 cases (10%); while, profound knowledge increased to 21 cases (42%) and superficial knowledge increased to 24 cases (48%).

The components of fuzzy set 2 demonstrated clearer classification of knowledge between profound and superficial as shown in Table 3.

Table 3: Classification of Knowledge of Entrepreneurs with Disabilities

	Knowledge Classification by Fuzzy Set 1			Knowledge Classification by Fuzzy Set 2		
	Profound	**Medium**	**Superficial**	**Profound**	**Medium**	**Superficial**
Group 1	7	7	11	11	1	13
Cambodia	0	1	3	0	1	3
Indonesia	1	2	0	2	0	1
Lao PDR	1	0	3	1	0	3
Myanmar	0	1	2	1	0	2
Philippines	0	2	1	1	0	2
Thailand	3	0	1	3	0	1
Vietnam	2	1	1	3	0	1
Group 2	10	4	11	10	4	11
Cambodia	0	1	3	0	1	3
Indonesia	1	1	1	1	1	1
Lao PDR	1	0	2	1	0	2
Myanmar	1	0	2	1	0	2
Philippines	1	0	2	1	0	2
Thailand	3	0	1	3	0	1
Vietnam	3	2	0	3	2	0
Groups 1 & 2	17	11	22	21	5	24

Classification of Understanding of Customers

The averages of availability of procurement (22 scores), product/service development (29 scores), distribution (21 scores), sales/marketing (3 scores) and customer service (8 scores) of entrepreneurs with disabilities in Group 1 were used to set parameters of membership function of productivity for fuzzy set 1. The fuzzy set 1 classified 7 cases (28%) as medium understanding, 6 cases (24%) as deep understanding and 12 cases (48%) as shallow understanding among entrepreneurs with disabilities of Group 1.

The parameter of membership function of fuzzy set 2 was set by the averages of major value chain components including procurement (22 scores), product/service development (29 scores) and distribution (21 scores). The fuzzy set 2 classified 4 cases (16%) as medium knowledge, 7 cases (28%) as profound knowledge and 14 cases (56%) as superficial knowledge among entrepreneurs with disabilities of Group 1.

For Group 2 of entrepreneurs with disabilities, the fuzzy set 2 also associated the clearer classification of understanding. The knowledge cases decreased to 4 (16%), with 10 profound knowledge cases and 11 superficial knowledge cases. For all entrepreneurs with disabilities with the fuzzy set 2, the number of medium understanding decreased from 14 cases (28%) to 8 (16%); while, deep understanding increased to 13 cases (26%) and shallow understanding increased to 29 cases (58%).

The components of fuzzy set 2 associated clearer classification of understanding between high and low as shown in Table 4.

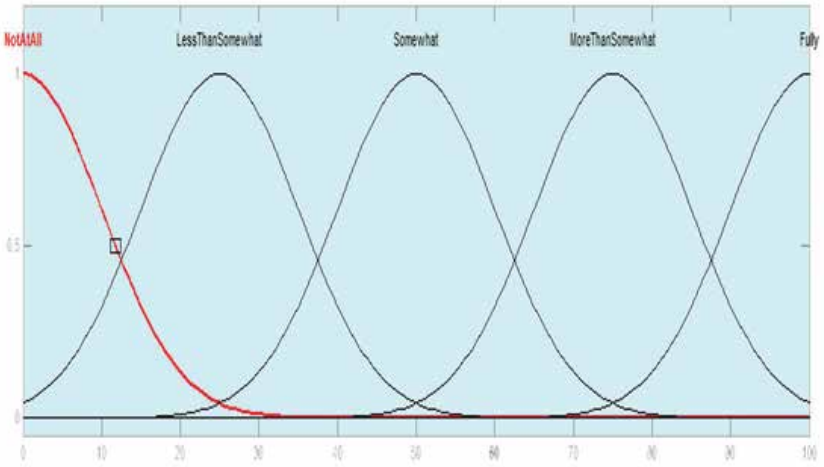
Table 4: Classification of Understanding of Customers

	Understanding Classification by Fuzzy Set 1			Understanding Classification by Fuzzy Set 2		
	Deep	**Medium**	**Shallow**	**Deep**	**Medium**	**Shallow**
Group 1	6	7	12	7	4	14
Cambodia	0	2	2	1	0	3
Indonesia	1	2	0	1	2	0
Lao PDR	1	0	3	1	0	3
Myanmar	1	0	2	1	0	2
Philippines	0	1	2	1	0	2
Thailand	2	1	1	2	1	1
Vietnam	1	1	2	0	1	3
Group 2	5	7	13	6	4	15
Cambodia	0	3	1	1	1	2
Indonesia	0	3	0	1	2	0
Lao PDR	0	1	2	0	1	2
Myanmar	1	0	2	0	0	3
Philippines	1	0	2	1	0	2
Thailand	2	0	2	2	0	2
Vietnam	1	0	4	1	0	4
Groups 1 & 2	11	14	25	13	8	29

Classification of Disability-Inclusiveness

The parameters of input membership function were set at 50 scores for productivity, knowledge and understanding. The output membership function was set in bell shape as shown in Figure 2.

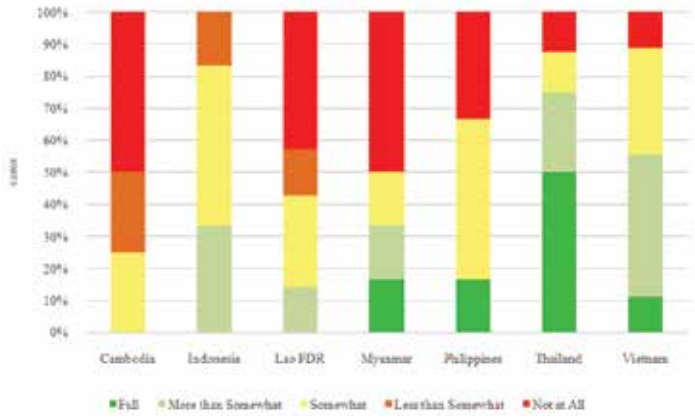
Figure 2: Disability-Inclusiveness Membership Function



The pattern of disability-inclusiveness per country is shown in Figure 3. The input membership function with fuzzy set 1 also showed the clearer classification of disability-inclusiveness. The numbers of somewhat cases changed as below:

- from 7 cases (28%) to 3 cases (12%) in Group 1 of entrepreneurs with disabilities
- from 8 cases (32%) to 6 cases (18%) in Group 2 of entrepreneurs with disabilities
- from 15 cases (30%) to 9 cases (18%) among all entrepreneurs with disabilities

Figure 3: Pattern of Disability-Inclusiveness



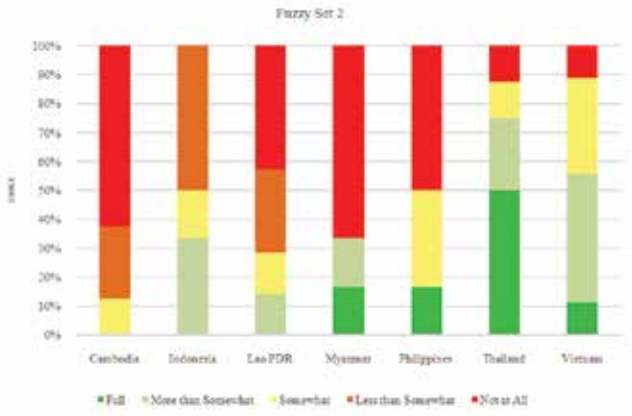


Table 5: Classification of Disability-Inclusiveness

	Disability-Inclusiveness Classification by Fuzzy Set 1					Disability-Inclusiveness Classification by Fuzzy Set 2				
	Not at All	**Less than Some-what**	**Some-what**	**More than Some-what**	**Full**	**Not at All**	**Less than Some-what**	**Some-what**	**More than Some-what**	**Full**
Group 1	9	2	7	5	2	11	3	3	4	4
Cambodia	2	2	0	0	0	3	1	0	0	0
Indonesia	0	0	2	1	0	0	1	1	1	0
Lao PDR	2	0	2	0	0	2	1	1	0	0
Myanmar	2	0	0	1	0	2	0	0	0	1
Philippines	1	0	2	0	0	2	0	0	0	1
Thailand	1	0	0	1	2	1	0	0	1	2
Vietnam	1	0	1	2	0	1	0	1	2	0
Group 2	5	2	8	5	5	6	4	6	6	3
Cambodia	2	0	2	0	0	2	1	1	0	0
Indonesia	0	1	1	1	0	0	2	0	1	0
Lao PDR	1	1	0	1	0	1	1	0	1	0
Myanmar	1	0	1	0	1	2	0	0	1	0
Philippines	1	0	1	0	1	1	0	2	0	0
Thailand	0	0	1	1	2	0	0	1	1	2
Vietnam	0	0	2	2	1	0	0	2	2	1
Groups 1 & 2	14	4	15	10	7	17	7	9	10	7

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As shown in Table 5, full disability-inclusive business was observed in Myanmar, the Philippines, Thailand and Vietnam. The disability-inclusiveness by fuzzy set 2 demonstrated clearer classification. The portion of somewhat cases reduced significantly in almost all countries except Vietnam.

- Cambodia: Disability inclusiveness was observed less in Cambodia. Most entrepreneurs with disabilities in Cambodia were not disability-inclusive with degree of "less than somewhat" and "not at all".
- Indonesia: Both "full" and "not at all" disability-inclusiveness was observed in Indonesia. The fuzzy set 2 enhanced clearer classification of disability inclusiveness in Indonesia than in other countries.
- Lao PDR: Disability inclusiveness was observed less in Lao PDR. The fuzzy set 2 turned "somewhat" cases into "less than somewhat" disability-inclusive cases.
- Myanmar: The portion of "not at all" disability-inclusive business in Myanmar was higher than other countries. The fuzzy set 2 turned all "somewhat" cases into "not at all" disability-inclusive cases.
- Philippines: With fuzzy set 2, the portion of "full" disability-inclusiveness was ranked top 2 while "not at all" disability inclusiveness was ranked top 3.
- Thailand: The portion of entrepreneurs with disabilities in Thailand demonstrated outstanding disability-inclusive business.
- Vietnam: Disability inclusiveness was observed clearly in Vietnam. Fuzzy set 2 did not affect the classification of disability-inclusiveness.

CONCLUSION

By using fuzzy logic, disability-inclusiveness was made more tangible. In this sense, the classification method of disability-inclusive business consisted of three components: 1) productivity of entrepreneurs with disabilities; 2) knowledge of entrepreneurs with disabilities; and, 3) understanding of customers. Moreover, the study showed that fuzzy logic techniques could be applied to clarify disability-inclusiveness, so as to give an overview of inclusion of persons with disabilities in different parts of Southeast Asia. Furthermore, the study data found that entrepreneurs with disabilities were active in procurement, product/ service development and distribution significantly. It is feasible for persons

with disabilities to start rural businesses by focussing on either one of three elements.

Limitations

This study has several limitations. The selected cases are all entrepreneurs with disabilities in rural areas, so the proposed method cannot be generalised for application in all types of businesses. The reason for the focus on entrepreneurs with disabilities was to clearly demonstrate the involvement of persons with disabilities in this study; however, the selected cases included 32 entrepreneurs with physical disabilities (64%), 5 entrepreneurs who are blind and with visual impairment (10%), and 3 entrepreneurs who are deaf, hard of hearing and deafened (6%). It was challenging to use fuzzy logic which has never been used in the context of disability, particularly when addressing persons with diverse disabilities.

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