



Faculty of Cognitive Sciences and Human Development

**Design, Validation, and Analysis of Perceived Sign Usability Scale
Vis-à-vis Cognitive Sign Characteristics**

Donald Anak Stephen

**Doctor of Philosophy
2018**

Design, Validation, and Analysis of Perceived Sign Usability Scale
Vis-à-vis Cognitive Sign Characteristics

Donald Anak Stephen

A thesis submitted

In fulfilment of the requirements for the degree of Doctor of Philosophy

(Cognitive Sciences)

Faculty of Cognitive Sciences and Human Development
UNIVERSITI MALAYSIA SARAWAK
2018

Grade: _____

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Final Year Project Report

Masters

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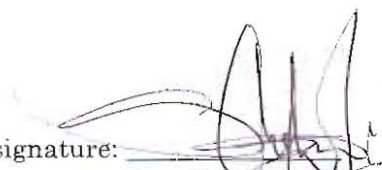
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ACKNOWLEDGEMENT

The only thing that we can be certain about research is the fact that it will never be certain. This is something that we eventually learn to realize but at times refuse to believe. I have grown and learned a lot in this journey. It was at times brutal, but it was a steep learning curve that I will always treasure. Although I have learned a lot, I realized there are a lot more that I do not know. This thesis was conceived with the help of an incredible support system, good coffees, and Elvis Presley's records. Therefore, writing this acknowledgement is an honour because it is an opportunity to formally express my gratitude. Of course, after working on this for many years, it would not be possible to list everyone who had helped. The Ministry of Higher Education has been incredibly generous by providing me with MyBrain15 scholarship. I am grateful to UNIMAS, especially the staffs (academic and non-academic), colleagues and fellow students in the Faculty of Cognitive Sciences and Human Development (FCSHD) as well as the Institute of Borneo Studies who have provided invaluable resources and support throughout my study.

I owe my development as a researcher and the completion of this thesis to my dear supervisor, Assoc Prof. Dr. Shahren Ahmad Zaidi Adruce who has been instrumental in this journey. Not only he has given me invaluable opportunities, inputs, and guidance, he also believed in me when I was struggling with self-doubt. For that, I am touched and profoundly grateful. I couldn't have climbed all the way up here with my puny knowledge and strength alone. Growing up with serious stuttering, my schoolteachers tirelessly trained my speech every morning before the first period. It was from that experience I aspire to be in the world of academia and to inspire others through education. This is one of the reasons why I wrote

this thesis (be sure to read problem statements for more reasons I wrote this thesis. Those are legit reasons as well).

I would also like to dedicate special acknowledgement to Dr. Philip Nuli Anding who was the Deputy Dean for Postgraduate and Research, who have worked tirelessly to help graduate students fulfill their potential. Not forgetting my co-supervisor, Dr. Ng Giap Weng, my proposal defense panels, item reviewers, friends as well as examiners who have all played an important role in my development as a researcher. I would like to dedicate this thesis to my family who have been unconditionally supportive throughout the entire duration of my study. I am sure that skills, experiences, and information I gained from this wonderful support system will be invaluable in future endeavors.

ABSTRACT

This study was galvanized by the lack of instruments to assess users' perception on sign usability. This study introduces Perceived Sign Usability Scale (PSUS), which is an instrument to assess sign usability pertaining to its cognitive sign characteristics (CSC). This study delineates the process of designing and developing the PSUS. The design of the instrument involves the development of items as well as a formula to calculate the composite score of PSUS. PSUS utilizes an open-ended sign comprehension test and Likert-type items to assess sign usability. The combination of both methods results in a more intuitive and valid instrument. This study adapts statistical methods such as the c-coefficient, Multiple Responses Analysis, Cochran's Q with Pairwise McNemar as post-hoc tests, as well as Rasch Analysis. This study has the potential to spearhead the emergence of sign usability studies both locally and internationally because of the identification of CSC, the introduction of PSUS, design framework/technique, as well as the derivation of formula to calculate the composite score of Likert-type items. Although PSUS is proved to be valid and reliable, it is still subjected to inevitable limitations. PSUS may not cover the complete extent of sign usability because it is an indubitable fact that human cognition and sign usability are complex. There could be more CSC emerged in the future to be integrated into the new version of PSUS. However, this limitation is not undesirable as it also serves as a catalyst that allows for continuous improvement of the instrument.

Keywords: Cognitive sign characteristics, Perceived Sign Usability Scale, instrument development.

Reka Bentuk, Pensahihan, dan Penganalisaan Instrumen Kebolegunaan Papan Tanda berlandaskan Ciri-ciri Kognitif

ABSTRAK

Kajian ini didorong oleh masalah ketandusan instrumen untuk mengkaji persepsi pengguna jalan raya terhadap tahap kebolegunaan papan tanda. Kajian ini menampilkan instrumen Skala Kebolegunaan Papan Tanda untuk mengkaji kebolegunaan papan tanda berdasarkan ciri-ciri kognitif. Kajian ini menghurai proses pengolahan instrumen yang merangkumi perolehan rumus untuk mengira skor gabungan. Instrumen ini menggunakan soalan kefahaman berbentuk terbuka dan juga item-item berskala Likert untuk mengukur tahap kebolegunaan. Implikasi daripada pembauran kedua-dua kaedah ini menyuguhkan keputusan analisa yang sahih dan mudah difahami. Proses pengolahan instrumen Skala Persepsi Kebolegunaan Papan Tanda ini menggunakan pelbagai kaedah statistik termasuklah pekali c, analisis respon majmuk, ujian Q Cochran, ujian McNemar dan juga model pengukuran Rasch. Kajian ini memangkin kajian-kajian lanjutan hasil daripada cetusan idea dengan adanya skala kebolegunaan, kerangka kerja reka bentuk, dan juga formula skor gabungan. Meskipun kesahihan telah dapat dipastikan, instrumen ini tidak lekang daripada kekangan ekoran kerumitan proses kognitif dan juga kebolegunaan papan tanda yang tidak dapat disangkal. Kajian ini tidak menafikan kemungkinan wujudnya ciri-ciri kognitif lain yang seharusnya diasimilasikan ke dalam instrumen. Namun demikian, perihal ini bukanlah sesuatu yang tidak diingini kerana kelansungan proses penambahbaikan instrumen dapat dilaksanakan.

Kata kunci: *Ciri-ciri kognitif, Skala Persepsi Kebolegunaan Papan Tanda, penghasilan instrumen*

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LIST OF ABBREVIATIONS

ARI	Automated Readability Index
CI/Cont.Int	Confident Interval
CLI	Coleman-Liau Index
CSC	Cognitive Sign Characteristics
DIF	Differential Item Functioning
Diff.	Difficulty
Discri.	Discriminant
FKGL	Flesch-Kincaid Grade Level
FOG	Frequency of Gobbledygook
GFS	Gunning-Fog Score
JMLE	Joint Maximum Likelihood Estimation
JMLE Diff.	Joint Maximum Likelihood Estimation Difficulty
MRA	Multiple Responses Analysis
MSE	Mean Square Error
PCAR	Principal Components Analysis of Rasch Residuals
PSUS	Perceived Sign Usability Scale
RP	Regulatory Prohibitive
RPP	Relative Participant Percentage
RRP	Relative Response Percentage
SD/Std. Dev.	Standard Deviation
SEM	Standard Error of Measurement
Sig.	Significant