

**PROFIL PENYELIDIKAN SKIM GERAN PENYELIDIKAN
PEMBANGUNAN PROTOTAIP (PRGS)**



**THE DEVELOPMENT OF A SOFTWARE PRODUCT SELF-
ASSESSMENT AND CERTIFICATION TOOLSET (MyCeSoft)
(PRGS/1/2015/ICT01/UKM/02/4)**

PROJECT LEADER

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Cluster Information and Communication Technology
Domain: Software

ABSTRACT

The *MyCeSoft* is useful and beneficial from the people who in-charge of maintaining and operating a particular system product and the stakeholders, to assess and certify the product quality from user's and technical perspective, within their environment and with their resources. Users and stakeholders can do self-assessment of their system products with their predefined criteria. This will enhance the quality of the system products as well as to improve the quality of life in the particular ecosystem and environment. The *MyCeSoft* contains special features that integrate the components of assessment and certification process from a technical perspective as well as user's view, selection criteria and enhanced decision making. The selection criteria will enable users to customise the assessment and certification standard criteria based on the organisation's needs. This tool promotes self-assessment and certification of a software product in any operating environment during its life cycle.

1. INTRODUCTION

For the last 15 years, our research group investigated issues of quality and certification and developed a fundamental model for software certification named as SCM-prod model. It was tested in real case studies and launched collaboratively with industries. A few software product certification models available currently, but they were with different approaches and aims, and none of them has been accepted universally and used as a commercialised standard mechanism and approach. The previous approaches in software certification are through the involvement of developers' certification, verification and validation techniques and laboratory testing. Our fundamental SCM-prod model is different from previous models where it is conducted through a collaborative perspective approach, involving user, developer and independent assessor. This model offers several interesting features and capabilities as discussed in [1][2]. It has been tested and implemented in software systems operating in real industry and government environment.

The processes invented and mentioned previously were done in a semi-automated approach and needed an integrated tool so that any interested parties can use it effectively and correctly. The development of the integrated toolset, *MyCeSoft* will solve the problem in determining the quality status of a software product at any time during its lifecycle. It promotes affordable self-assessment and certification tool for continuous improvement of a software product.

The problem statement is based on the following scenario: - MedicSoft Sdn. Bhd. develops and produces Hospital Information System and medical applications for several organisations and agencies related to medical services through-out Malaysia. Currently, the company is moving toward internationalisation with potential clients from Indonesia and other neighbouring countries. Meanwhile, the stakeholder of this company wants to ensure that the software product developed by this company provides the best quality services as well as meets the quality standard acceptable by the industries. Therefore, this company requires a simple and practical mechanism and tool to enable monitoring, assessing and certifying any software products in the industry. Previous models only focused on technical and internal software quality assessment for generic software. The research project thus will accommodate and deliver indicator on the quality of the services provided by MedicSoft Company Sdn Bhd as well as to other related companies in the industry. Furthermore, the companies in the industry can make their monitoring, assessment and certification to ensure the expected services provided

by their company is achieved and guaranteed. At the same time, we also received requests from internal and external agencies on having a self-assessment and certification specifically from a user's perspective and expectation. The stakeholders and developers wish to know the quality of their products from the user's views so that the product developed will be accepted by the users. Therefore, the proposed tool and mechanism for assessment and certification shall be different from previous certification models which, in this proposed approach, organisations or companies can do self-assessment and certification without involving laboratory test or third-party assessment and certification. The assessment can be done at their operating ecosystem and environment and with their resources.

2. OBJECTIVES

The objectives of this project are as follows:-

- I. To identify the requirement specification of the integrated self-assessment and certification prototype
- II. To design the integrated self-assessment and certification prototype (*MyCeSoft*)
- III. To construct a new integrated architecture and the prototype of *MyCeSoft*
- IV. To test and evaluate the prototype in real environment.

3. RESEARCH METHODOLOGY

The methodology is as follow:

Phase 1: Requirement Specification

This phase was to identify requirements based on previous certification model (SCM-Prod model). This activity included reviewing the contribution works done previously which were the SCM-Prod model, intelligent and dynamic features of quality model and metrics selection model.

Phase 2: Design

The design of the proposed integrated *MyCeSoft* prototype and toolset was conducted. The design should be comprehensive, wider requirement specification and scope. The design phase produced the architecture of the new integrated prototype system. Database and user interface design took placed in this phase too.

Phase 3: Development

Based on the input from the previous stage, the development of *MyCeSoft* was conducted according to systematic development approach. The development of the prototype was recommended through outsourcing development approach. This was to ensure the quality of the prototype with all the identified features embedded properly and guaranteed in the prototype system. The prototype should be commercialised and dynamic system prototype.

Phase 4: Testing and Refinement

The developed system prototype underwent a testing stage which also included verification and validation processes. The verification and validation concerned that the prototype being developed met its specification and delivered the functionality expected by the users. The system prototype was refined based on the testing results.

Phase 5: Product Packaging

At this final phase, the toolkits and guideline for product package were prepared finalised and prepared,

4. LITERATURE REVIEW

In general, certification can be referred to as an official document of good quality. Certification is also a written assurance by a third party organisation that a product or services conform to specified characteristics [3]. It is applied in various commercialise products such as electric and electronic goods, pharmaceuticals and healthcare products, manufacturing items and many more. With certification applied and embedded together with the product profile, users are confident with the quality of the goods and products. Previous work by Voas [4] indicated that software certification can be viewed in three different perspectives which are through the development process, the end product quality and the people that involve in development. Software certification offers benefits and values to several groups including the developer, producer (stakeholder and vendor) as well as the end-users. In user perspective, certification is a mechanism to guarantee that the software is good at a certain level of quality standard. Few approaches in software certification which through involvement end user in the process by delivering information regarding the usage of the software [11], developers' self-certification [12] and verification and validation techniques [13]. Korea is among the most leading country in Asia that requires certification of a software product in their country. The quality certification program is called Good Software and was implemented over the last 10 years and the benchmark used in this assessment is based on ISO9126 quality model and integrated with Korea industrial requirements. The certification process is implemented in the laboratory that involves executing and testing the software [14].

In the certification process, a quality model is the required benchmark and standard needed to be embedded and integrated into the whole processes. There are a few software product quality models available in the literature and the well-known are McCall, Boehm, FURPS, ISO9126, Dormey, SQuaRE and Pragmatic Quality Model or PQF. However, these models mainly focus on technical perspective and limited concern with user's or human's perspective in the assessment of software products. ISO/IEC 15504 is the reference model for the process assessment and ISO9126 is the reference model for product assessment. Both reference models focus on technical aspects of development and product quality. The new enhanced model of ISO9126 which is known as ISO25010 or part of System and Software Quality Requirements and Evaluation (SQuaRE) standard is still focusing on the technical aspects of the software. This model includes attributes to measure product quality which employing functionality suitability, performance efficiency, compatibility, usability, security, reliability, maintainability and portability. It is noticed that additional new attributes in ISO 25010 compare to ISO9126

are security and compatibility [5]. In these mentioned models the assessment was done by the independent assessors and developers, and not much space given to the users of the system software to assess the system operating in their environment. PQF quality model and SCM-Prod certification model was invented by our research group in 2007 with the intention for technical and behavioural perspectives [1][2]. At the current trend, software quality models are still in the scope of technology, and behavioural views of assessment [6].

Our previous research projects and experiences have indicated and revealed that involvement of users in software assessment and certification process enables to evaluate the quality of software products based on user's expectations and needs [3][7]. However, SCM-Prod and other certification models do not emphasis on the quality metrics of user-centric perspective and approach. The emergence of social networks such as Facebook, Twitter, Telegram and Instagram show the influence of computers in creating relationships and bonds among people all over the world. The integration of human's activities and ICT appliances connects people anytime and anywhere through software applications. Thus, this situation creates the user's centrality paradigm where people and users are the key actors in the scenarios. Therefore, the user-centricity approach in software development and quality assessment are relevant and significant. In cloud computing too, the invention towards user-centricity approach is being explored that enable cloud services through this mechanism [8].

Another approach of certification is based on the development process such as the ISO 9000 series and Software Engineering Institute's Capability Maturity Model Integration (CMMI). The approaches have been popular among software vendors in Europe and the United States. CMMI is a process improvement model for software development and the basic idea of its implementation is through maturity concept. This model made certain that every organization has a certain capability to produce software. Similarly, few other researchers focused on process assessment such as SPICE and Bootstrap. Another similar research was conducted by our research group to deal with certification by the development process and the model developed was named as SPAC [9]. This work was further explored into agile software development to come out with an enhanced process-based certification model [10]. For this proposal, our research implements certification based on product quality approach.

The second research carried out by our research group focused on the development of the intelligent and dynamic model of software quality using Feature Ranking Technique. This research was completed and produced the algorithm for intelligent and dynamic model of software product quality which was considered as a new approach in software quality [15][16]. The algorithm would be embedded in the new proposed prototype to support the dynamic quality assessment attributes and process. In the latest works, we have developed a software quality and certification model based on user-centricity approach. It was named as *UcSoftC*. In this model, the assessment criteria are based on a user's perspective and perceive which are needed and demanded in the current computing environment [17][18]. Based on these related works, it was recommended and justified that the fundamental software certification model (or SCM-prod) was needed to be embedded and emerged as an integrated prototype of self-assessment and certification system which was proposed in this proposal.

5. FINDINGS

For the last 15 years, our research group has explored and investigated issues related to quality and certification. We managed to develop a fundamental model for software product certification named as SCM-prod model. SCM-Prod model had been tested in real case studies and implemented collaboratively with industry. A few software product certification models have shown available in the literature study but with different approaches and aims, and none of them has been accepted universally. None of them has been considered and used as a commercialized product. Previously, the approaches in software certification were through developers assessment, verification and validation techniques, and laboratory testing. Our fundamental SCM-prod model is different where it is conducted through a collaborative perspective approach which involves user, developer and independent assessor. Besides, the assessment is conducted at the user's operating environment. It offers several interesting features and capabilities. The four objectives of this research have been achieved and completed successfully. The main outcomes of this research include the software assessment and certification prototype (*MyCeSoft*), a promotion video and copyright. The *MyCeSoft* toolset will solve the problem in determining the quality status of a software product at any time during its life cycle. It promotes affordable self-assessment and certification tool for continuous improvement of a software product in any organisation. The copyright application was completed on 13th Nov 2017 with file no. UKM IKB/108/2/1492.

6. CONCLUSION

The self-assessment and certification tool is developed that contains the described features and capabilities. The *MyCeSoft* is a tool that promotes self-assessment and certification of a software product in any operating environment. It contains special features that integrate the components of assessment and certification process from user's and technical perspective, selection criteria and enhanced decision making. This tool is useful because it provides a complete cycle of a software assessment process. This tool will solve the problem of determining the state of the concerned software quality level at any given time during its life cycle. *MyCeSoft* provides main functions which are login function, assessment instrument, product registration form, assessment and certification report, and system setup.

This research project has successfully developed and produced a new quality determination mechanism which formulated formally. The mechanism implementation is supported by a computerised system based on the cloud environment and can be accessed anywhere at any time. The mechanism and product have the potential to be commercialised through in-service training (quality training), consultation project and third party quality control services (outsourcing). This research project should involve collaboratively with the government agency that will potentially gain the benefit from the developed product. Also, this product can be commercialised in wider target groups such as government and private agencies.

This research project was granted and funded by the Malaysia Ministry of Higher Education under the Prototype Research Grant Scheme (PRGS). It started on 1 July 2015 and ended on 31 December 2017. The project collaborator was TEKNOLOGI MS

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ACHIEVEMENT

- i) Prototype Development (Name & % Completion)
MyCeSoft (100% completion) (<http://mycesoft.com/login.php>)
- ii) Application for a pre-commercialization fund (Yes/No; If Yes, please specify)
Not Yet
- iii) Intellectual Property (IP) (Yes/No; If Yes, please specify)

YES,

a) Copyright Application File : UKM IKB/108/2/1492

b) Promotion Video : MyCeSoft (<https://www.youtube.com/watch?v=24uruy-O8c8>)
- iv) Commercialization (Yes/No; If Yes, please state Organization, Status, Income etc.)
- v) Human Capital (RA/RO). (Yes/No; If Yes, please state the Name of RA/RO)

[SITI ROHANA BINTI AHMAD IBRAHIM \(KS15042\)](#)
[850523015174](#)
- vi) Awards / Others (Yes/No; If Yes, please specify)
Nil

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**APPENDIX A
PROOF OF IP**

THE MATTER of Section 42 of the *Copyright Act, 1987*, Malaysia

STATUTORY DECLARATION

I, Prof Dr Khairiah Haji Badri (NRIC No. 701123-01-6312) of full age and of Centre for Collaborative Innovation (CCI), Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor Darul Ehsan, Malaysia do solemnly and sincerely declare as follows: -

1. I am the Director of Centre for Collaborative Innovation (CCI) of Universiti Kebangsaan Malaysia, a university incorporated under the laws of Malaysia with an address at Universiti Kebangsaan Malaysia, 43600, UKM Bangi, Selangor Darul Ehsan, Malaysia (hereinafter referred to as "UKM")
2. I am duly authorised to make this Statutory Declaration on behalf of UKM. Unless otherwise stated, the fact herein are within my own knowledge or derived from the records of UKM to which I have access.
3. I am advised and verily believed that copyright subsists in the following work is identified accordingly below (hereinafter referred as "the Work") and a copy of the Work are annexed accordingly:

Exhibit No.	Title	Authors & NRIC No./Passport No	Date completed
1	SOFTWARE PRODUCT SELF-ASSESSMENT AND CERTIFICATION TOOL (MyCeSoft)	JAMALIAH BINTI YAHAYA (630305-08-5006) AZIZ BIN DERAMAN (591108-11-5043) ABDUL RAZAK BIN HAMDAN (540205-01-5853) ZULKEFLI BIN MANSOR (780904-02-5957) YUSMADI YAH BIN JUSOH (721002-03-5654) SITI ROHANA BINTI AHMAD IBRAHIM (850523-01-5174)	31 st DECEMBER 2017

4. I am advised and verily believed that copyright subsists in the Work by virtue of the following fact that:
- a) the Authors, were and are at all material times citizens of Malaysia and the Work was created and completed in Malaysia on the date set out in paragraph 3 above. The Work qualify for copyright protection under the Copyright Act 1987 by virtue of Section 3 and Section 10 of the Copyright Act 1987.
 - b) sufficient and substantial skill, effort and time has been expended on the Work by the Authors to render them original in character under Section 7(3)(a) of the Copyright Act 1987.
 - c) the Work have been reduced to material form as required under Section 7(3)(b) of the Copyright Act 1987 as at the date of completion as set out in paragraph 3 above.
5. I am advised and verily believed that at all material times UKM is the owner of the copyright subsisting in the said Work by virtue of the following facts that: -
- a) at all material times, the Authors namely Jamaiah Binti Yahaya (630305-08-5006); Abdul Razak Bin Hamdan (540205-01-5853); Zulkefli Bin Mansor (780904-02-5957) and Siti Rohana Binti Ahmad Ibrahim (850523-01-5174) were and are employees of Universiti Kebangsaan Malaysia ("UKM") and the Work was created by the Authors in the course of employment with UKM;
 - b) at all material times, the Author namely Yusmadi Yah Bin Jusoh (721002-03-5654) was and is an employee of Universiti Putra Malaysia ("UPM") and the Work was created by the Author in the course of employment with UPM;
 - c) at all material times, the Author namely Aziz Bin Deraman (591108-11-5043) was and is an employee of Universiti Malaysia Terengganu ("UMT") and the Work was created by the Author in the course of employment with UMT;
 - d) at all material times, the Work was created, developed, generated using material, funds and other resources owned by UKM;
 - e) at all material times, the Work was created with support and supervision of employees of UKM; and
 - f) at all material times, the Work was commissioned or created under direct request of UKM.

By virtue of Section 26(2) (a) and (b) of Copyright Act 1987, the copyright of the said Work is deemed to be owned by UKM.

- 6. UKM now asserts copyright in the Work and hereby claims ownership in the copyright subsisting in the Work at all material times.
- 7. The Work is eligible for copyright protection as literary work under the Copyright Act 1987 and by virtue of the Copyright (Application to Other Countries) Regulations 1990, the Berne Convention for the Protection of Literary and Artistic Works 1886 extends copyright protection for the Work to all member countries of the Berne Convention.
- 8. Furthermore, UKM has also not at any time authorised any third party in Malaysia or elsewhere to reproduce any part of the Work.

And I make this solemn declaration conscientiously believing the same to be true and by virtue of the provision of the Statutory Declaration Act 1960.

Subscribed and solemnly)
declared by the abovenamed)
Prof Dr Khairiah Haji Badri)
(NRIC No. 701123-01-6312))
at Hentian Kajang)
Selangor)
on this day of 27 AUG 2018)



Before me,




Commissioner for Oath

No. 274, Tingkat 2,
Kompleks Hentian Kajang,
Jalan Reko, Selangor.

IN THE MATTER of Section 42 of the
Copyright Act 1987, Malaysia

EXHIBIT 1

This is the exhibit marked 1, referred on in the Declaration of, Prof Dr Khairiah Haji Badri (NRIC
No. 701123-01-6312) affirmed on the 27 day of AUG 2018 2018.



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**APPENDIX B -
APPOINTMENT OF RA/RO**



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LAPORAN PERUBAHAN GAJI

Bendahari
Universiti Kebangsaan Malaysia
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Rujukan : UKM3.2.8/244/35
Tarikh : 19/09/2015
No KWSP : 17770175

PERLANTIKAN BARU PEMBANTU PENYELIDIK

Perubahan berikut telah diluluskan.
Sila buat perubahan pembayaran pegawai yang berkenaan sebagai yang tersebut.
Kod Projek : PRGS/1/2015/ICT01/UKM/02/4

NAMA / JAWATAN / JABATAN	TARIKH	GAJI BULANAN
SITI ROHANA BINTI AHMAD IBRAHIM PUSAT PENYELIDIKAN TEKNOLOGI & PENGURUSAN PERISIAN (SOFTAM) PEMBANTU PENYELIDIK No. K/P : 850523015174 Tarikh lahir : 23.05.1985 Tarikh lantikan : 15.09.2015 hingga 14.02.2016		
Gaji Pokok	15.09.2015 - 14.02.2016	2,000.00

Catatan : Sila bayar mulai penama melapor diri


DR.(Ph.D) WAN ROSMANIRA ISMAIL
TIMBALAN PENGARAH
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Bendahari
Universiti Kebangsaan Malaysia
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Rujukan : UKM PPI/244/52
Tarikh : 11/02/2016
No KWSP : 17770175

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Perubahan berikut telah diluluskan.
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NAMA / JAWATAN / JABATAN	TARIKH	GAJI BULANAN
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	Gaji Pokok 15.02.2016 - 14.07.2016	2,000.00

Catatan : Diluluskan tempoh perlanjutan Pembantu Penyelidik berkuatkuasa pada 15.02.2016 sehingga 14.07.2016

ENCIK MOHD NAJIB BIN ADUN
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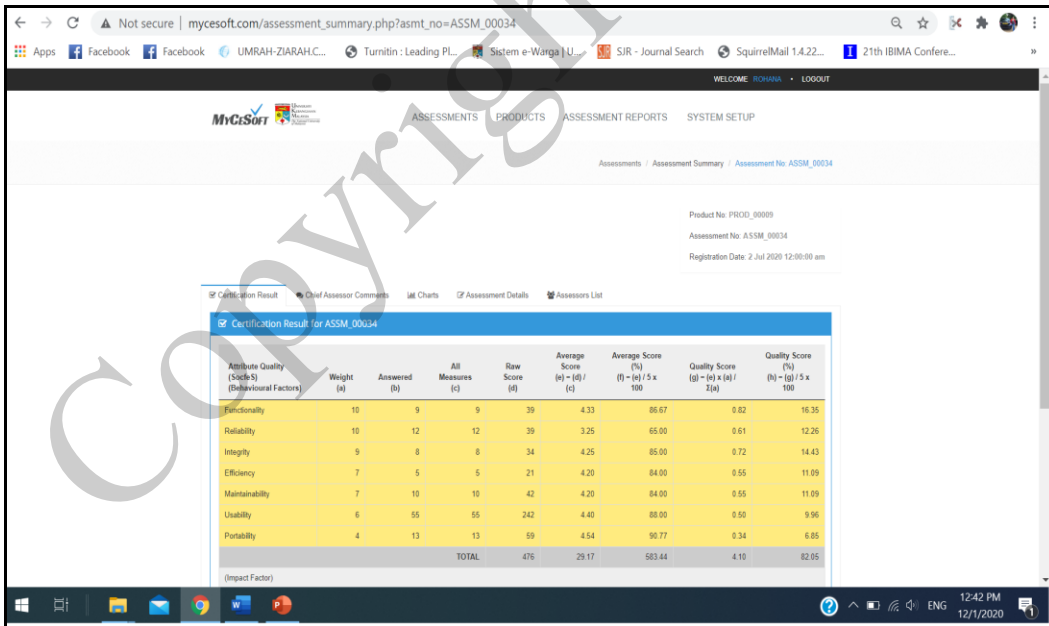
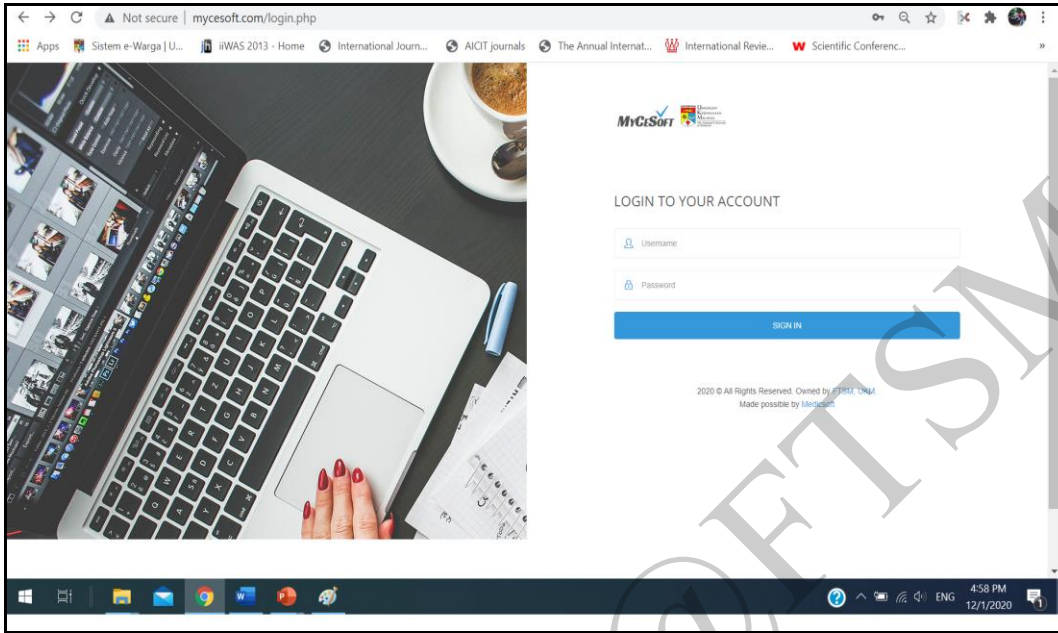
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Gaji Pokok	15.07.2016 - 14.10.2016	2,000.00

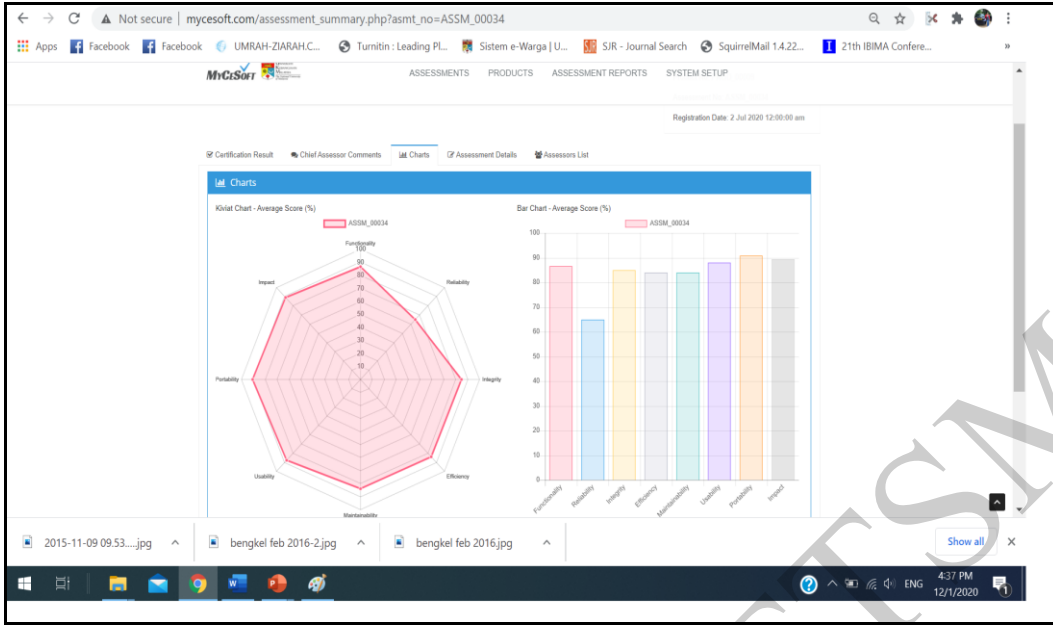
Catatan : Diluluskan tempoh perlanjutan Pembantu Penyelidik berkuatkuasa pada 15.07.2016 sehingga 14.10.2016

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PUSAT PENYELIDIKAN TEKNOLOGI & PENGURUSAN PERISIAN (SOFTAM)
FAKULTI TEKNOLOGI & SAINS MAKLUMAT
 - 3- Ketua
PUSAT PENYELIDIKAN TEKNOLOGI & PENGURUSAN PERISIAN (SOFTAM)
 - 4- Pengarah, Pusat Pengurusan Penyelidikan dan Instrumentasi

APPENDIX C
PICTURES OF PROTOTYPE





WELCOME | [Home](#) | [Logout](#)

Products [Add New](#)

Show 10 entries

Product No	Product Name	Description	Date Produced	Class of Application	No of Current Users	Active State
PRD_0001	MyCaSoft	Software Certification	2017-07-17 00:00:00	1	3	1
PRD_0002	C-Hits	Hospital Information System	2017-09-05 00:00:00	1	100	1
PRD_0003	e-warga	web-based system on UKM portal	2017-11-30 00:00:00	2	0	1
PRD_0004	Sistem HEP		2020-05-13 00:00:00	1	10	1
PRD_0005	Aduan MCMC System	The Aduan MCMC System is an online complaint communication channel for the consumers to lodge complaints to the Commission on any issues related	2020-05-17 00:00:00	1	5	1
PRD_0006	Maybank2U	Payment facility designed for small or home businesses conducting online transactions	2020-05-23 00:00:00	1	0	1
PRD_0008	SETEL	Setel is Malaysia's first mobile app that makes refuelling seamless and convenient	2020-05-29 00:00:00	1	10	1

WELCOME HAHANA - LOGOUT

MyCSort

ASSESSMENTS PRODUCTS ASSESSMENT REPORTS SYSTEM SETUP

Companies Add New

Show 10 entries

Search:

Company ID	Company Name	Address	Tel No	Contact Person	Active State
1	HainuLogic Ventures	Sekyen 5. Bangi	0187786500	Khairul	1

Showing 1 to 1 of 1 entries

Previous 1 Next

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ASSESSMENTS PRODUCTS ASSESSMENT REPORTS SYSTEM SETUP

Assessments / Assessment Summary / Assessment No: ASSM_0005

Product No: PROD_00001
Assessment No: ASSM_00005
Registration Date: 11 Oct 2017 12:00:00 am

Certification Result Chief Assessor Comments Chat Assessment Details Assessors List

Assessment Details

Assessment Period: 11/10/2017 to 18/10/2017

Product Attributes (Weights):

Functionality	8	Reliability	9
Integrity	10	Efficiency	5
Maintainability	6	Usability	7
Portability	2	Impact	Pre-valued by system

Save changes

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APPENDIX D
PHOTOS OF RESEARCH ACTIVITIES





**This report is prepared by:
ASSOCIATE PROF DR JAMIAH YAHAYA
PROJECT LEADER**

1 December 2020