

# HLI Work Force Characteristic and IR 4.0: Psychometrics Profiling Perspective

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Industry 4.0 (IR 4.0) is the implementation of Cyber Physical Systems for production. Its impact on the manufacturing sector and other technology sectors are well documented. However, the impact on the human resource sector is understudied. Managing the human capital of IR 4.0 is not an easy task since it requires continuous innovation and learning dependent on people and enterprise's capabilities. Personality profiling strategy for appropriate worker screening approaches can play a vital role in the development of dynamics capabilities in Higher Learning Institutions (HLI). This paper aims to present worker screening approaches using systematic psychometrics profiling that promotes a climate of innovation and learning in organizations, and hence facilitates businesses to match the pace of IR 4.0. The overview employs a personality profiling framework with 15 personality domains that are developed in an integrated and systematic tool named as i-PRO (Integrated Profiling System). One of the major concepts applied was the application of Holland Individual-Environmental Congruency career interest, and adapting various established psychometrics profiling approaches, as an initiative towards adequate systematic screening strategy for recruitment, placement, succession plan, and planning the organizations' personnel development training.

**Key words:** *Personality profiling, higher learning institution. human capital management, IR 4.0.*



## Introduction

Personality profiling is a systematic process used to record and analyse employees personality traits. By understanding an individual's personality, the organization management team would be able to understand what may influence ones' personal and social life behaviours. The result of incompatible traits and characteristics is usually effected performance (Holland, 1997).

Industry 4.0 (IR 4.0) is the implementation of Cyber Physical Systems smart manufacturing for industrial production. Managing the human capital in the era of IR 4.0 is not an easy task since it requires continuous innovation and learning dependent on people and enterprise's capabilities. In the context of Higher Learning Institution (HLI), the impact of IR 4.0 should too to be visited and addressed in the benefits of its learner and workers.

## Industry 4.0 and HLI Scenario

Professor Klaus Schwab, founder and Executive Chairman of the World Economic Forum, in the WEF annual meeting held on 20-23 January 2016 has elaborated the meaning and how to respond to The Fourth Industrial Revolution as;

*“..... a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will unlike anything humankind has experience before. We do not yet know just how it will unfold, but one thing is clear; the response so it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society.”*

The Higher Education community too should respond to challenges in a comprehensive manner. Woolf (2010) addressed some grand challenges of Artificial Intelligence (AI) in education and addressed them with five actions. 1) Virtual mentors for every learner; omnipresent support that integrates user modelling, social simulation, and knowledge representation. 2) Addressing 21<sup>st</sup> century skills, assisting learners with self-direction, self – assessment and teamwork. 3) Analysis of interaction data; by bringing together vast amounts of data about individual learning, social contexts, learning contexts, and personal interest. 4) Provide opportunities for global classrooms by increasing the interconnectedness and accessibility of classrooms worldwide. 5) Lifelong and life-wide technologies by taking learning outside of the classroom and into the learner's life outside of school.

Professor Colin B. Grant, Vice President (International), University of Southampton, in the University Presidential forum in 2017, stated that the IR 4.0 Challenge to HLI as;

*“Their readiness in responding to the 4<sup>th</sup> IR, and questioned if universities are capable of managing the convergence, fluidity, power shifts, contingency and ethical issues that came along with the 4<sup>th</sup> IR.”*

He emphasized that investment in emerging technologies and human connectivity, building digital resilience, as well as institutional capabilities in digital governance and accountability, are key strategies for survival; and he added that, it is unclear whether the higher education community are doing enough to adapt.

Both Woolf and Professor Collin addressed similar points on the aspects of individual characteristics in facing IR 4.0 challenges in HLI. As mentioned by Woolf, the third challenge of analysing Big Data about individual styles of learning and working, the learner or worker’s social contexts, learning and working contexts and understanding personal interest were among the main objectives of personality profiling. Understanding learners and workers will assist the effort of the second challenge addressed by Woolf; assist the learner’s self-direction towards his/her potential. Strengthened by Professor Collin, there is the need for “institutional capabilities” in digital governance. These points directed us towards the important of understanding every person potential, and the one approach is through profiling their personality traits.

In any type of organization environment, not to exclude the HLI, there is important to profile its citizen (Yusoff et al. 2006), ultimately in facing the challenges in this era of IR 4.0. Evidences in the extant literature have shown that personality characteristics play an important role in the influence of an individual’s work performances and achievement. The plethora of evidences available in the literature unfortunately deal mainly with individual personality characteristics. Thus, the ability to provide holistic and integrated personality domains of individual personality are needed in the dynamic and changing organization (Yusof et al. 2016).

Personality profiling strategies for screening the right workers can become an important strategic approach in the development of dynamics capabilities in an organization. This paper aims to present an approach to HLI of workers and prospect student screening using systematic psychometrics profiling, that will promote a climate of innovation and learning in the organization, hence facilitating the busines to match the pace of IR 4.0. Profiling is important in giving an overview to the organization management in improving and developing modules that are necessary for the future individual development programs such as, training modules, intervention programs, performance enhancement programs, organizational succession planning, and career development programs (Yunus, 2004), as well as enhancing work performance and job promotion exercises. Therefore, this work promotes a platform to profile individuals for the workplace. Using the Individual-Environmental Congruence Theory (Holland, 1958, 1997), as the major fundamental towards matching

individual to their work environment has become the main fundamental concept of profiling approach discussed in this paper.

Therefore, there should be efforts placed on developing a holistic and integrated personality profiling tool that works as a mechanism of proper screening in the workforce. Failure to recognise the right worker for the job will result in the company recruiting and placing an inappropriate and incompetent workers into the job. A personality type would only be considered undesirable to the extent to which it counters the work performance and expectations of a particular work environment (Holland, 1999).

### **Individual-Environmental Congruence Theory**

The relationship between personality characteristics of individuals toward work performance are well established in literature. John Holland's Individual-Environmental Congruence Theory is regarded as the most influential in the field of career counselling (Brown, 2002). Therefore, Holland's theory and the subsequent research on it were explored to determine an appropriate means of understanding the behaviour and organization of members. Holland concentrated on the differences between individuals, rather than their similarities. He defines six types of individuals (Realistic, Investigative, Artistic, Social, Enterprising and Conventional) and recognizes that these types will have different occupational interests.

Since its emergence more than fifty years ago, Holland's theory has become a major force in applied psychology. It has emphasized the "searching" aspects of person environment fit: "The person making a vocational choice in a sense searches for situations which satisfy his hierarchy of adjusted orientations" (Holland, 1997). There was also an emphasis on the acquisition and processing of environmental information. "Persons with more information about occupational environments make more adequate choices than do persons with less information." A precursor article on the Vocational Preference Inventory (VPI) in 1958 (Holland, 1958), describes the core of the theory as the projection of one's personality onto the world of the workplace. The choice of an occupation is an expressive act which reflects the person's motivation, knowledge, personality, and ability. Occupations represent a way of life, an environment rather than a set of isolated work functions or skills. To work as a carpenter means not only to have a certain status, community role, and a special pattern of living. This Individual-Environmental Congruency Theory has become the main fundamental concept of proposed profiling tool. Holland's Codes and the abbreviation RIASEC refer to John Holland's six personality types: Realistic, Investigative, Artistic, Social, Enterprising and Conventional. Career Key organizes and scientifically classifies careers, college majors, career clusters, and career pathways by these personality types.

**Table 1:** RIASEC: The Holland's Six Type

<b>Personality Types</b>	<b>Description</b>
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<b>Realistic (R)</b>	They particularly value people who are practical and mechanical - who are good at working with tools, mechanical or electrical drawings, machines, or animals.
<b>Investigative (I)</b>	They particularly value people who are precise, scientific, and intellectual - who are good at understanding and solving science and math problems.
<b>Artistic (A)</b>	They particularly value people who are expressive, original, and independent - who have good artistic abilities in creative writing, drama, crafts, music, or art.
<b>Social (S)</b>	They particularly value people who are helpful, friendly, and trustworthy - who are good at good at teaching, counselling, nursing, giving information, and solving social problems.
<b>Enterprising (S)</b>	They particularly value people who are energetic, ambitious, and sociable - who are good at politics, leading people and selling things or ideas.
<b>Conventional (C)</b>	They particularly value people who are orderly, and good at following a set plan - good at working with written records and numbers in a systematic, orderly way.

*Source:* Holland (1997)

Table 1 is based on Holland's theory which concludes people and work environments can be loosely classified into six different groups. Each of the letters above corresponds to one of the six groups described in the following pages. Different people's personalities may align better with different environments. While one person have some interests in and similarities to several of the six groups, and may be attracted primarily to two or three of the areas. These two or three letters are the individual "Holland Code." For example, with a code of "RES", a person would most resemble the Realistic type, somewhat less resemble the Enterprising type, and resemble the Social type even less. The types that are not in one's code are the types an individual resembles with least of all. Most people, and most jobs, are best represented by some combinations of two or three of the Holland interest areas. In addition, most people are most satisfied if there is some degree of fit between their personality and their work environment.

A Holland Code is a three-letter code that is made up of an individual's three dominant personality types out of six possible choices, according to Holland. Examples of three codes are; RSI, REC, IAS, ICS, ACE, AIS, SEA, SIA, EIS, ESA, CSI, CRE etc.

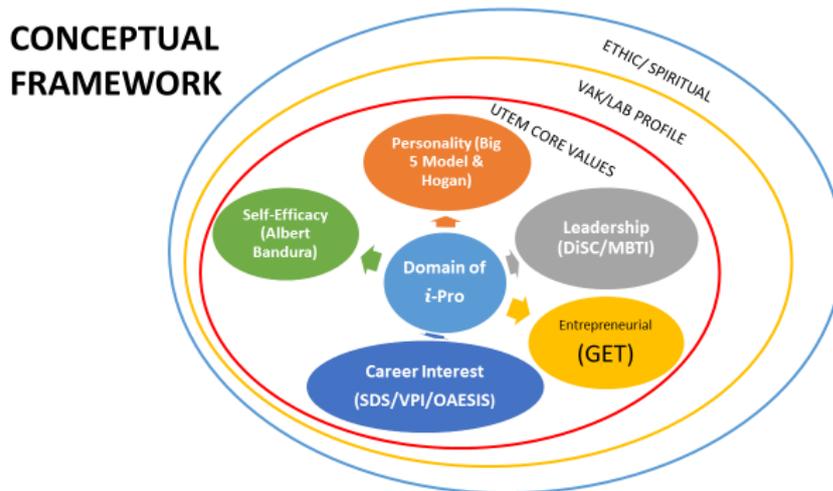
Being an institution for promoting knowledge, every HLI is a dynamic entity of gathering various skills for the workforce. It became more crucial in the challenging era of IR 4.0, where thr combination of varied skills should be the competitive advantages of every

individual in the workplace in HLI. Beside traditional teaching methods, lecturers nowadays must practice the implementation of Cyber Systems in teaching activities such as: e-learning, a clear classroom, using Big Data offered, and there should be the basic competency of academic personnel in HLI. The administrator of effective HLI organization too, should be well-matched to the work environment by their working potential determined by their personality traits.

### ***i*-PRO: The Tool for Personality Profiling**

A tool named *i*-PRO is an Integrated Personality Profiling System, developed for Universiti Teknikal Malaysia Melaka (UTeM), and the main purpose to profile its staff and students. The conceptual framework of this tool covers combination of various personality traits domains is as shown in the Diagram 1 below.

**Diagram 1.** *i*-PRO Personality Conceptual Framework



In whole, domains of the profiling developed for *i*-PRO covers 3 + 1 domains. Three

main domains are; 1) Personality; 2) Competency; and 3) Core Values, and “Ethics & Spiritual” as Domain Across. These three main domains were break into few sub-domains as shown in Table 2 below.

Main Domains	Personality	Competency	Core Values
Sub Domains	1. Self-Orientation 2. Career Orientation	1. Entrepreneurial 2. Interpersonal	1. Readiness for change

	3. Psycho-Social 4. Dominant brain 5. Self-Representation 6. Leadership	3. National Identity	2. Resilience 3. Loyalty 4. Integrity 5. Professionalism
<b>Domain Across</b>	Ethics & Spiritual		

**Table 2:**  
- *i*-  
PRO  
Main

### Domains and Sub-domains

These profiling domains were adapted from various instruments such as the Holland Person-Environment Fit, Hogan Personality, and Myer-Briggs Type Indicator. The Big Five Personality were adapted as main based theory. It also embedded the organizations core values, the institutions 20 years strategic plan, and the Malaysian Education Blueprint known as Pelan Pembangunan Pendidikan Malaysia, Pendidikan Tinggi (PPPM PT). All these aspects have been integrated as a fundamental domain of the instrument. This is regard to the importance of the instrument tailored to need of the organization (Musa et al., 2017).

The Individual-Environment Congruency concept is one of the domains of *i*-PRO, as one of the main purposes to profiling an individual correctly to their working environment. For the purpose of addressing the issue of HLI work force in the era of IR 4.0, this paper will discuss thoroughly the concept of Individual-Environment Congruency applied in *i*-PRO. Following section will describe the process of matching an individual to the working environment.

### ***Working Environment Holland's Three-Letter Code***

In table 1 above, the working environment is suitable for every individual will conclude into Holland's Three-Letter code. The Three-Letter summary code provides the description of the work or occupation. For example, the code of ESC for Business Manager means that business managers resemble people in Enterprising occupations most of all, Social occupations somewhat less, and Conventional less than both. In this way, the codes provide a brief

summary of what an occupation is like by showing its degree of resemblance to three occupational groups.

Individuals can easily explore their choices of available occupations with regards to Holland's Three-Letter Code. Holland has developed The Dictionary of Occupational Finder (DOF), listed almost all job's in the US as a guide to explore the choice of jobs by Holland's Three-Letter Code. Today, there are a variety of tools available to help the distribute the list to individuals to explore and learn more about their chosen career in the market. All of these tools contain vast lists of careers with Holland's Three-Letter Code (RIASEC), and they are available online. The O\*Net Interest Profiler for example, is a free online tool developed by O\*Net for the [U.S. Department of Labour](http://www.dhs.gov) Employment and Training Administration, which categorized and listed a huge number of careers to the Holland's Three-Code. Almost all HLI in the US too have listed their academic major to the Three-Code of this Holland's theory. One of it is University of Missouri, in the United States. Some other examples are as shown in Table 3 below.

**Table 3:** Sample of sources for Career/ Occupation and HLI Academic Major by Holland's Three-Letter Code.

LIST OF CAREER/OCCUPATION BY THREE-LETTER HOLLAND CODE	
Career Database Resources Provider	Resources Page
Occupational Database	<a href="http://www.vista-cards.com/occupations/">http://www.vista-cards.com/occupations/</a>
O*NET	<a href="https://www.onetonline.org/find/descriptor/browse/Interests/">https://www.onetonline.org/find/descriptor/browse/Interests/</a> <a href="https://www.mynextmove.org/explore/ip">https://www.mynextmove.org/explore/ip</a>
LIST OF HLI ACADEMIC MAJOR BY THREE-LETTER HOLLAND CODE	
HLI	Resources Page
Arizona State University	<a href="https://cisa.asu.edu/majorexploration/RIASEC">https://cisa.asu.edu/majorexploration/RIASEC</a>
Indiana University	<a href="https://acd.iupui.edu/explore/choose-your-major/connect_majors-to-careers/interests/index.html">https://acd.iupui.edu/explore/choose-your-major/connect_majors-to-careers/interests/index.html</a>
University of Missouri	<a href="http://www.wiu.edu/advising/docs/Holland_Code.pdf">http://www.wiu.edu/advising/docs/Holland_Code.pdf</a>

For the case of UTeM, the Three-Letter Code for the lecturers have already been determined. This was based on the required competency of all positions of a lecturer's function in line with the needs of the organization. This Holland Three-Letter Code list will be referred to for the lecturer's recruitment exercise. Table 4 below shows the example of the Holland's Three-Letter Code of lecturers for UTeM.

**Table 4:** UTeM Lecturer Holland's Three-Letter Code by Position, Track and Specialization.

GRADE	VK7			DS53			DS51		
TRACK	T&L	R&D	Pro.	T&L	R&D	Pro.	T&L	R&D	Pro.

Eng & Ts	SIR	IRS	SRI	Eng & Ts	SIR	IRS	SRI	Eng & Ts	SIR	IRS	SRI
ICT	SIC	ICS	SCI	ICT	SIC	ICS	SCI	ICT	SIC	ICS	SCI
Mngt.	SIE	IES	SEI	Mngt.	SIE	IES	SEI	Mngt.	SIE	IES	SEI
PBPI	SIA	IAS	SAI	PBPI	SIA	IAS	SAI	PBPI	SIA	IAS	SAI

Information gathered from the example of the above-mentioned resources are the manifestation of understanding what Holland's Three-Letter Code is used for in the working or study environment that an individual is suited to. This will later be used in the process of mapping with the data of Holland's Three-Letter Code for individual obtained from the analysis of *i*-PRO.

***Person-Environment Congruency: Individual Holland's Three-Letter Code***

Responses by individuals to psychometrics items of the career orientation domain using *i*-PRO will later analyse and provides everyone the individual Holland's Three-Letter Code.

**Table 5:** Individual's Holland's Three-Letter Code Personality Profile

R	I	A	S	E	C	<b>Holland's 3-code</b>
21	19	11	7	17	13	<b>RIE</b>

In table 5 above, shows how the score was analysed to conclude as the Holland's Three-Letter Code for the individual who uses *i*-PRO. The score for every personality type will gather, where out of six types, the three highest score will be determined as the Three-Letter Code for that individual. Based on scores in the table, three types of personality with the highest score are R (21), I (19), and E (17). This concludes that the Holland's Three-Letter Code for this individual is RIE.

***Person-Environment Congruency: Congruency between Personality Types and Work Environment***

To determine the congruency level of individuals, the Iachan Congruency Index (1984) will be used. The Iachan Congruency Index (1984) is used because it is a complete degree of compatibility and is suitable for measuring two and three-letter codes in the classification system (Holland, 1997). In addition, the Iachan Congruency Index has a high degree of correlation index of  $r = 0.74$  (Miller and Mark, 1992). Furthermore, the Iachan Congruency Index is an accurate measurement of the degree to be used in the field of research. The example of congruency degree analysis using the Iachan Congruency Index is as described as follows.

Environment Holland's Three-Letter Code (*for the environment chosen*)

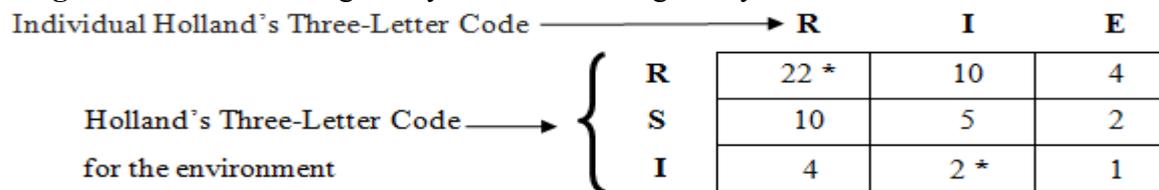
- R S I

Individual Holland’s Three-Letter Code profiled using *i*-PRO

- R I E

Based on the above mentioned data, the environment code score as according to Holland are “R, S and I”. This Holland’s Three-Letter Code was decided after referring to the DOC using one of the online databases as explained in para 4.1 above. The individual Holland’s Three-Letter Code’s that were obtained by the analysis of *i*-PRO are “R, I and E”. Using the Iachan Congruency Index, the mapping of these two set of Holland’s Three Letter Code is as explain in diagram 2 below.

**Diagram 3.** Holland Congruency and Iachan Congruency Index Level



**Source:** Naemah (2007)

Based on Diagram 3, both sets of scores are arranged i.e. the individual code obtained from *i*-PRO analysis arranged horizontally from left to right, and the environment scores according to Holland are arranged vertically from top to bottom. For “R” code, it ranks as the primary code, scores 22 points, and code “I” both match the value of 2 points (i.e. as a secondary code for the individual code, and the tertiary code for environment code according to Holland). The Iachan Congruency level score of this respondent is 24 (22 + 2 = 24).

**Table 6:** Congruency Workers’ Personality Profile

SCORE	CONGRUENCY LEVEL
26-28	Highly Congruence
20-25	Congruence
14-19	Not Congruence
13 and LESS	Highly Not Congruence

**Source:** Miller and Cowger (1998)

As refer to in Table 6, the Iachan Congruency level score of this respondent is 24 (22 + 2 = 24), and the congruency result for this individual is Congruence. This is how the interpretation of congruency level of individual to his/her working or learning environment.

## Conclusion

This systematic psychometrics profiling would be able to be utilised in promoting a climate of innovation and learning in an organization, and hence able to facilitate businesses in the era IR 4.0. By employing the application of Holland Individual-Environmental Congruency career interest concept and adapting various psychometrics profiling approaches in proposing an integrated personality framework as an initiative towards adequate systematic screening



strategy for recruitment, placement, succession plan, and planning the organizations' personnel development training for IR 4.0 (Saad et al, 2018).

As Woolf and Professor Collin are concerned, is to understand individual style of learning and working which should assist the learner and worker in their self-direction when working towards his/her potential. The importance of profiling citizens of the organization in facing the challenges in this era of Industry 4.0 which require every work force to have multi-disciplinary skills and competencies. Thus, the ability to provide holistic and personality traits of individual is an ultimate need in dynamic organization in the era of the implementation of Cyber Physical Systems for organization production.

The personality profiling strategy for screening the right workers can become an important strategic approach in the development of dynamics capabilities in the organization. The *i-PRO* or similar tool would be able to provide an overview to the organization top management in improving managing the human capital for IR 4.0.

### **Acknowledgement**

The author wishes to express gratitude and thank you to Universiti Teknikal Malaysia Melaka (UTeM) for its support in the advancement of this work under The Short Term Grant Research Scheme PJP/2017/FPTT/S01521.



## REFERENCES

- Brown, D. (2002). Introduction to theories of career development and choice. In D. Brown (Ed.), *Career choice and development, 4th edition* (pp. 3–23). San Francisco: Jossey-Bass.
- Colin B. Grant, C.B. (2017), The IR 4.0 Challenge to Higher Education, *University of Southampton Presidential forum 2017*
- Holland, J. L., & Holland, J. (1999). Why interest inventories are also personality inventories. In M. Savickas & A. Spokane (Eds.), *Vocational interests: Meaning, measurement, and counseling use* (pp. 87-102). Palo Alto, CA: Davies-Black.
- Holland, J. L. (1997). *Making vocational choices: A theory of vocational personalities and work environments*. Odessa, FL: Psychological Assessment Resources.
- Holland, J. L. (1958). A personality inventory employing occupational titles. *Journal of Applied Psychology*, 42, 336-332.
- Iachan, R. (1984). Measurement of Agreement for Use with Holland Classifications System. *Journal of Vocational Behaviour*. 24: 133-141.
- Miller, M.J. & Cowger, E.L (1998). Degree of the relationship between the college majors finder and anticipated college majors among high school students. *College Student Journal*
- Musa, H., Safri, N., Yunus A.R., Mohd Azlishah Othman, M.A. (2017). The Characteristics of Users in the Adoption of Low Loss Microwave Transmission Glass: A Conceptual Paper. *Procedia-Social and Behavioral Sciences*, 548-554.
- Naemah Hamzah (2007). Pattern Compatibility of Personality Environment Six Religious Careers with Employment Satisfaction in the State of Johor. Unpublished study of Imam, University of Technology Malaysia, Johor Bharu.
- Saad, M.S.M., Yunus, A.R., Kamarudin, M.F., & Ibrahim, I. (2018), An integrated personality profiling framework to identify and produce talent in a technical university, *World Transactions on Engineering and Technology Education*, Vol.16, No.1, 2018, pp. 80-83
- Schwab, K (2016), *Mastering the Fourth Industrial Revolution* World Economic Forum Annual Meeting 2016 held on 20-23 January 2016



Woolf, B. P. (2010). *A roadmap for education technology*. Retrieved 4 June 2013 from <http://www.coe.uga.edu/itt/files/2010/12/educ-tech-roadmap-nsf.pdf>.

Yunus, A.R. (2004). [Personality congruence and compliance: A study among Students of a Higher Learning Institution in Sabah](#). *Unpublished Fundamental Research Report. Universiti Malaysia Sabah, Kota Kinabalu.*

Yusof, N. S. H. C., Yap, B. W., Maad, H. A. & Hussin, W. N. I. W. (2016). Relationship between Emotional Intelligence and University Students' Attitude. *Pertanika J. Soc. Sci. & Hum.* 24 (S): 119 – 130

Yusoff, H., Bakar, Z.A. & Alias, R.A. (2006) *Polygraphic Counterproductive Behavior Index Profiling System*.