MyAnalyser - A Handwriting Analysis System for Career Guidance

Siew Hock Ow and Kean Siang Teh*

Department of Software Engineering, Faculty of Computer Science and Information Technology, University of Malaya, 50603, Kuala Lumpur, Malaysia

* Corresponding author. E-mail: keanteh@yahoo.com

ABSTRACT

Handwriting Analysis or Graphology is a field of study that uses analysis of handwriting to identify a person's personality and character. This information about a person has been used by employers during job interviews to determine whether a candidate is suitable to fill a job vacancy or role. A research was conducted to study the effectiveness of handwriting analysis to assist in career guidance. In this connection, a computer-based handwriting analysis system, MyAnalyser, was developed as a dynamic web application for the purpose, using Microsoft ASP 3.0 as the programming language and Microsoft Access as the database management system. A survey was conducted to collect samples of handwritings of participants who comprised IT professionals in the Klang Valley of Malaysia, for analysis. The handwriting analysis identified the personality type and the recommended occupations for different personality types of the participants. The handwriting analysis results were evaluated by the participants themselves to determine the accuracy of the personality type identified and occupations recommended by MyAnalyser by comparing the personality type identified with participants' own personality type and the recommended occupations with the participants' current or expected occupation. The results of the evaluation show that of 264 participants, 201 (76.14%) participants agreed that the personality types identified by MyAnalyser are accurate, and 219 (82.95%) participants said that the occupations recommended by MyAnalyser match their current or expected occupations.

Key words: Handwriting analysis, Graphology, Career guidance, Computer-based handwriting analysis, MyAnalyser

INTRODUCTION

Handwriting Analysis or Graphology is a field of study which uses analysis of handwriting to identify a person's personality and character. It is not something new but has existed a long time ago with reports about it from many countries such as Italy, Germany, France, Britain and the United States of America (Lowe, 1999). One of the commonly-and widely-use applications of handwriting analysis is in the employment field. Companies and employers are looking into handwriting analysis to complement their conventional screening of job applicants (Schorr, 1999). This is because the conventional screening process such as interviewing applicants, reviewing applicants' educational background, their working experiences and other information will not reveal the applicants' personality or the personality traits suitable for a certain job. European employers often require applicants to submit their resume written in their own handwriting. The resume is submitted for handwriting analysis which would reveal the personality type of the applicants (Kohn, 2003).

Companies, however, cannot do it on their own because handwriting analysis is a complicated and complex task that requires the service of qualified and experienced graphologists. It may take a few hours or even a few days to analyse a page of handwriting, depending on the level of detail and comprehensiveness of the report required. Owing to the amount of time, exhaustion due to repetitive analysis, complexity of the processes and the need to produce reports to clients in a timely manner, graphologists have realised the importance of computerising their handwriting analysis process. Computer-assisted graphology software or handwriting analysis system allows graphologists to meet the increasing demands for their skills. Some graphologists have even commercialised their handwriting analysis system as off-the-shelf software. Sheila Lowe & Associates is an example of a graphology Website (RI Software Inc., 2004) and there are many similar Websites.

It would be beneficial to Malaysian workers if they were able to determine their personality type and plan their career path accordingly. It would also be useful to the employers to be able to determine the personality of the candidates they are interviewing to determine whether they posses the required personality for a job vacancy or work role. According to John Holland's *Career Personality Theory*, choosing the career path or occupation that match with the personality type would likely lead to job success and satisfaction.

Currently, there is no handwriting analysis system to determine a person's personality and provide career guidance based on their personality in Malaysia. In view of this, a research was conducted to analyse a person's handwriting and this also led to the development of a handwriting analysis system for career guidance to determine his personality and career path. The handwriting analysis system, called MyAnalyser, consists of two major components comprising the handwriting analysis and career guidance. MyAnalyser was developed with the objective to offer handwriting analysis to identify personality type and to recommend suitable occupations as career guidance. Companies and even individuals in Malaysia can use MyAnalyser to complement their existing applicants' screening process and to determine their career path, respectively.

METHODOLOGY

John Holland's *Career Personality Theory* and the combination of handwriting analysis techniques (French and German approaches) were used to develop MyAnalyser.

Following the development of MyAnalyser, a survey was conducted to collect handwriting samples and handwriting data of the participants. The collected data were used as the inputs for MyAnalyser. Finally, a system evaluation was conducted to determine the accuracy of the results generated by MyAnalyser. Figure 1 illustrates the methodology used in this project.
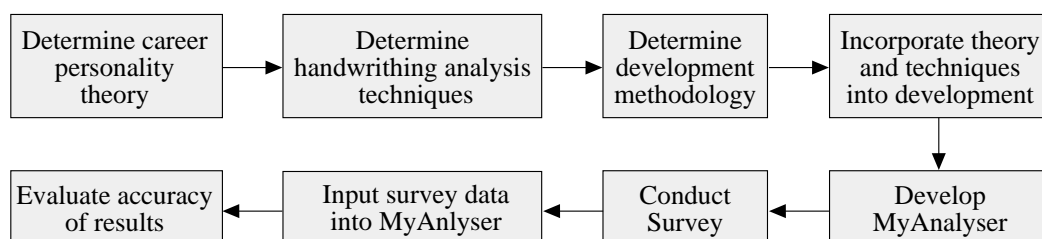

Figure 1. Methodology.

Theory and Techniques

John Holland's *Career Personality Theory* was selected because it is best known for matching personality types or traits to different jobs. His Realistic, Investigative, Artistic, Social, Enterprising and Conventional personality traits are widely used for career counselling and fitting people with interests and compatibility to over 1,300 jobs.

A combination of German and French approaches were used as the handwriting analysis techniques. A set of handwriting characteristics was identified for each of the John Holland's six personality traits. Each handwriting characteristic was selected because it has been proven and widely used to identify and analyse a person's handwriting for Realistic, Investigative, Artistic, Social, Enterprising and Conventional personality traits. The handwriting characteristics that are used to analyse the same personality type are grouped together. Table 1 shows the grouping of handwriting characteristics for each of John Holland's six personality traits.

Table 1. John Holland's Six Personality Traits and Handwriting Characteristics.

John Holland's Six Personality Traits	Handwriting Characteristics	Description
Realistic	Size	Large, Medium or Small
	Style	Enriched, Simplified and retain its legibility or basic structure or Neglected (Simplified and missing some essential lines)
	Baselines	Rising, Falling, Stable, Wavy, Concave or Convex
Investigative	Style	Enriched, Simplified and retain its legibility or basic structure or Neglected (Simplified and missing some essential lines)
	Connectivity	Connected, Disconnected or Mixed
	Slant	Right, Left, Upright or Mixed
	Size	Large, Medium or Small
Artistic	Slant	Right, Left, Upright or Mixed
	Flow	Rhythmic (Pattern produced by stressed and unstressed syllables in words) or Arrhythmic (Non-rhythmic or not having a pattern of its own)
	Regularity	Regular or Irregular
Social	Working Spacing	Balance, Close or Wide
	Dominant	Upper zone, Middle zones or Lower zones
	Slant	Right, Left, Upright or Mixed
Enterprising	Letter 'u' or 'n'	Broad, Balance or Narrow
	Baselines	Rising, Falling, Stable, Wavy, Concave or Convex
	Pressure	Heavy, Medium or Light
Conventional	Distance between lines	Large, Balance or Close
	Flow	Rhythmic (Pattern produced by stressed and unstressed syllables in words) or Arrhythmic (Non-rhythmic or not having a pattern of its own)
	Letter 'm' or 'n'	Letter 'm' looks like a "w" or 'n' looks like 'u', Rounded, Pointed Top or Wavy Top

Development Methodology

The Systems Development Life Cycle (SDLC) was used as the development methodology for MyAnalyser. This methodology establishes procedures, practices and guidelines governing the planning, requirements analysis, design, development, implementation, operations and support of information systems. It includes the following five phases during which defined IT work products are created or modified (Shelly et al., 2003).

i. Systems Planning

The initiation of a system (or project) begins when a business need or opportunity is identified. Once a business need or opportunity is approved, the approaches for accomplishing the concept are reviewed for feasibility and appropriateness. The concept is further developed to describe how the business will operate once the approved system is implemented. To ensure that the products and/or services provide the required capability on time and within budget, project resources, activities, schedule, tools and reviews are defined.

ii. Systems Analysis

Functional user requirements are formally defined and the requirements are delineated in terms of data, system performance and maintainability. All requirements are defined to a level of detail, sufficient for systems design to proceed. All requirements need to be measurable and testable and must relate to the business need or opportunity identified in the systems planning phase.

iii. Systems Design

The physical characteristics of the system are designed during this phase. The operating environment is established, major subsystems and their inputs and outputs are defined and resources are allocated to processes. The physical characteristics of the system are specified and a detailed design is prepared.

iv. Systems Implementation

The detailed specifications produced in the systems design phase are translated into hardware, communications and executable software. Software shall be unit tested, integrated and retested in a systematic manner. The various components of the system are integrated and systematically tested. The system is tested to ensure that the functional requirements, as defined in the functional requirements document, are satisfied by the developed or modified system. The system or system modifications are installed and made operational in a production environment after the system has been tested. Systems implementation phase also includes an assessment or evaluation to determine whether the system operates properly and according to expectations.

v. Systems Operation and Support

The system is monitored for continued performance in accordance with user requirements and any necessary system modifications are incorporated. When modifications or changes are identified, the system may re-enter the systems planning phase.

Not every project will require that the phases be sequentially executed. However, the phases are interdependent. Depending upon the size and complexity of the project, phases may be combined or overlapped. The development of MyAnalyser did not go through all the phases of SDLC except only the phases that are applicable. Table 2 illustrates the development phases of MyAnalyser.

Table 2. Development Phases of MyAnalyser.

Development Phases	Description
Requirements Analysis	Functional requirements and non-functional requirements of MyAnalyser were defined in this phase. This phase also describes the processes, tools and diagrams used to define and identify the functional requirements and non-functional requirements of MyAnalyser.
Design	Design phase transforms the detailed, defined requirements of MyAnalyser into complete, detailed specifications for the system to guide the work of the development phase. This phase also addresses in detail, how MyAnalyser will meet the defined functional, physical, interface and data requirements.
Development	Development phase translates and converts the system design produced in the design phase into a working system capable of addressing the system requirements. This phase also addresses the programs, hardware, software, environment and other important elements of MyAnalyser.
Testing	This phase subjects the developed MyAnalyser to tests to ensure it meets all the functional requirements as well as the non-functional requirements defined in the requirements analysis phase.
Evaluation	MyAnalyser is evaluated in this phase to determine its usability and usefulness. This phase also evaluates the accuracy of the handwriting analysis results produced by MyAnalyser based on participants' feedback.

On 26th May 2004, www.myanalyser.net was registered as the domain name for MyAnalyser with the Malaysian Network Information Centre (MYNIC) of MIMOS BERHAD. MyAnalyser was migrated to the hosting environment on 1st June 2004 and it was made available to Internet users on 1st June 2004.

Survey

The survey questionnaire was chosen as the data collection or gathering method for this research because it is inexpensive to administer and a large amount of quantifiable data can be gathered within a short period of time (Graziano and Raulin, 1997). The survey was conducted to collect the handwriting samples and handwriting data of the participants. The questionnaires were distributed in hardcopy by hand, through email and were also posted on the MyAnalyser Website. Participants could participate in the survey and conduct the handwriting analysis at the same time in MyAnalyser.

Evaluation Methodology

The handwriting samples and handwriting data of the participants were used as inputs into MyAnalyser to generate the handwriting analysis result. Each handwriting analysis result consists of two parts. The first part of the result identifies which of the John Holland's six personality traits or types a participant belongs to. The second part of the result identifies the working environments and occupations that are suitable for the personality type or trait identified in the first part.

The accuracy of the handwriting analysis result was evaluated by the participants them-selves after viewing their own handwriting analysis result. Participants evaluate the accuracy of the handwriting analysis results by answering two questions. The first question asks the participant whether the personality type or trait identified by MyAnalyser matches his/her real personality type. The second question asks the participant whether the working environ-ments and occupations recommended by MyAnalyser match his/her current or expected occupation and work environment. The answers or feedback regarding the accuracy of the handwriting analysis result were obtained from returned evaluation questionnaires or from the answers or feedback submitted on the Web-based MyAnalyser.

The overall accuracy of the handwriting analysis results was determined by looking at the total number of participants who either agreed, partially agreed or disagreed with the personality type identified by MyAnalyser in the first part of the result and the total number of participants who indicated whether their current or expected occupations match or do not match the occupations recommended by MyAnalyser.

SAMPLING

Working adults from the Information Technology (IT) sector in the Klang Valley were chosen to participate in the survey.

Survey Objective

The survey is used to collect the handwriting samples and handwriting data from participants to be used for the handwriting analysis in MyAnalyser. The actual survey was conducted from 4th June 2004 to 6th August 2004.

Survey Design

The survey questionnaire was designed to ensure good response by making the survey questions easily understood, not too lengthy and not too boring.

The survey questionnaire consists of three parts. The first part consists of questions to collect the personal details and profile of participants. In the second part, participants provide their handwriting samples on the blank page. After the participants had provided their hand-writing samples on the blank page, they can proceed to the last part of the survey question-naire to answer the handwriting analysis questions. The handwriting analysis questions are incorporated in MyAnalyser. The handwriting analysis questions are used to collect partici-pants' handwriting data or details on their handwriting characteristics. Participants answer the handwriting analysis questions by comparing and matching their handwriting samples written on the blank page with each option provided in the handwriting illustrations to find the nearest match. As the hardcopy survey questionnaire cannot produce the handwriting analysis results, the handwriting data in the survey questionnaire returned by participants will be entered into MyAnalyser to produce the handwriting analysis result. The handwriting analysis result and the user evaluation questionnaire were sent to participants via email. Participants who had conducted the handwriting analysis in MyAnalyser could view their handwriting analysis result immediately after the analysis, and evaluate the accuracy of the handwriting analysis results.

Pilot Test

The objective of the pilot test is to obtain feedback on the survey questionnaire before the actual survey is conducted. The feedback will show reveal mistakes that have been overlooked and other issues that have not been considered. The pilot test was conducted on a

small group of working adults from 9th April 2004 to 6th May 2004. Twenty sets of survey questionnaires were distributed for the pilot test and all were collected and returned on time.

SURVEY QUESTIONNAIRE

In the actual survey, one hundred sets of survey questionnaire were distributed to working adults from the IT sector, of which 39 sets were returned. Out of the 39 sets, 21 sets were rejected due to ambiguous data and/or incomplete information. Only 18 sets were accepted for analysis. On the other hand, 294 working adults from the IT sector participated in the survey and handwriting analysis in MyAnalyser available online. Out of the 294 participants, the responses from 48 participants were rejected because the answers were ambiguous or unclear, or not complete, or the questions were not answered according to the instructions given. Thus, the responses from 264 participants were accepted for analysis. The use of MyAnalyser to conduct Web-based questionnaire is effective for reaching large numbers of participants quickly and easily. It can also provide immediate validation and enforce rules on inputs to avoid ambiguous and invalid data (Preece et al., 2002).

USER EVALUATION

Designing a useful system requires iterative cycles of design and evaluation processes to ensure that the system meets the users' needs. Evaluation is driven by questions about how well the system or particular aspects of the system have satisfied users' needs. Users play an important role in the system development and their involvement in the evaluation process is crucial to ensure that the developed system is easy to use, useful and meet users' needs (Dix et al., 1998).

There are many evaluation techniques, and one of which seeks the users' opinions of the system. The use of a questionnaire is the main technique for doing this. The questions can be unstructured or highly structured. Participation in the questionnaire survey could be very high if it is implemented using email or is Web-based (Preece et al., 2002).

Online questionnaire was chosen to obtain the users' evaluation of MyAnalyser. The online questionnaire was implemented using two methods. The first method was implemented by sending the softcopy of the handwriting analysis results and user evaluation questionnaire to participants via email. The second method was implemented with Web-based user evaluation questionnaire in MyAnalyser. Both online questionnaires consist of open and closed-end questions. Further improvements and enhancements were made to MyAnalyser based on the feedback and opinions from the questionnaires.

The majority of the members said that the response time of MyAnalyser to analyse members' handwriting data and to generate the handwriting results was not more than 5 seconds.

ACCURACY OF HANDWRITING ANALYSIS RESULT

This section discusses the accuracy of the handwriting analysis result generated by MyAnalyser. The handwriting analysis result is generated based on the handwriting data derived from the handwriting analysis questions answered in the handwriting analysis. The handwriting data were collected from the Web-based handwriting analysis conducted by members or participants in MyAnalyser and from the hardcopy of the handwriting analysis survey questionnaires returned by the participants.

Altogether, 100 sets of handwriting analysis survey questionnaires were distributed and only 39 sets were returned. Of the 39 sets, 18 sets were accepted for analysis and 21 sets were rejected due to incomplete and ambiguous information given. The information and handwriting data of the accepted sets were entered into MyAnalyser to produce the hand-writing analysis results which were used to determine the accuracy of the results. The online MyAnalyser had 294 registered participants, of which 246 participants were accepted while that of 48 participants were rejected because the latter did not conduct the handwriting analysis and had provided incomplete information. The handwriting analysis results were subsequently evaluated for accuracy.

In total, 264 sets of handwriting analysis results were gathered and used to evaluate and determine the accuracy of the results generated by MyAnalyser. Each handwriting analysis result consists of the personality type identified and occupations recommended by MyAnalyser. The section below discusses the evaluation on the accuracy of the handwriting analysis results.

Accuracy of the Identified Personality Type

This section discusses the evaluation on the accuracy of the personality type identified by MyAnalyser. The accuracy was determined based on the feedback in the user evaluation questionnaire returned by participants and the evaluation given by members after viewing their handwriting analysis result in MyAnalyser. Figure 2 shows the accuracy for the personality type identified as evaluated by a member in MyAnalyser.
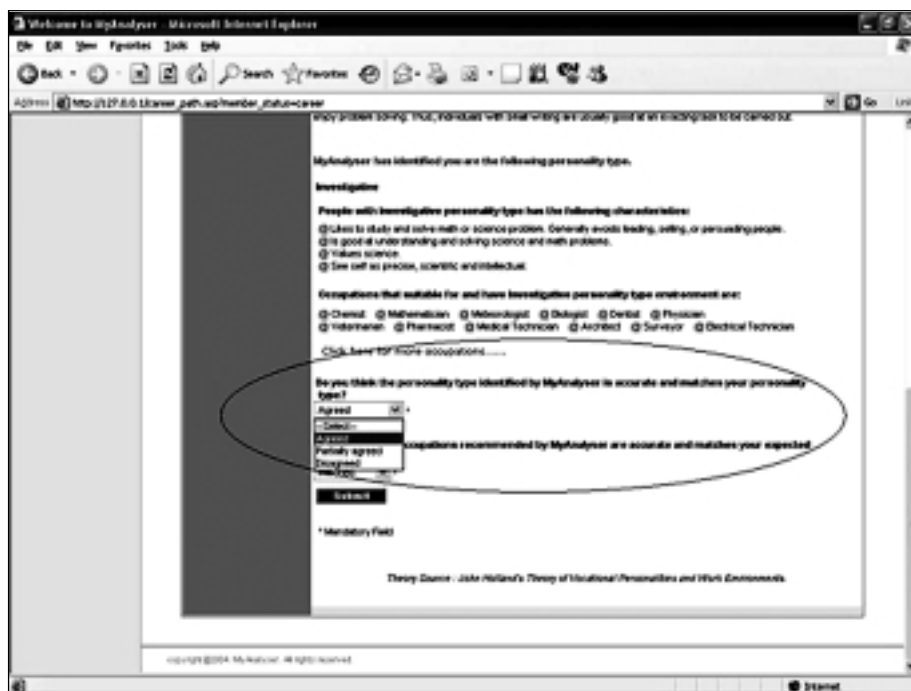

Figure 2. Evaluation Question on the Accuracy of the Personality Type Identified by MyAnalyser.

Table 3 illustrates the statistics for accuracy of personality type identified by MyAnalyser. The statistics shows that of the total of 264 participants, 201 (76.14%) participants agreed with the personality type identified by MyAnalyser, 35 (13.26%) participants partially agreed, and only 28 (10.61%) participants disagreed. Based on the findings, it can be concluded that the personality type identified by MyAnalyser is accurate.

Table 3. Statistics on the Accuracy of Personality Type Identified by MyAnalyser.

	Accuracy Level		
Participants	Agreed	Partially Agreed	Disagreed
IT Professionals in Klang Valley of Malaysia	201	35	28
Percentage	76.14%	13.26%	10.61%

Accuracy of the Recommended Occupations

This section discusses the evaluation on the accuracy of the occupations recommended by MyAnalyser. The accuracy was determined based on the feedback in the user evaluation questionnaire returned by participants and the evaluation given by members after viewing their handwriting analysis result in MyAnalyser. Figure 3 shows the accuracy of the occupations recommended as evaluated by a member in MyAnalyser.
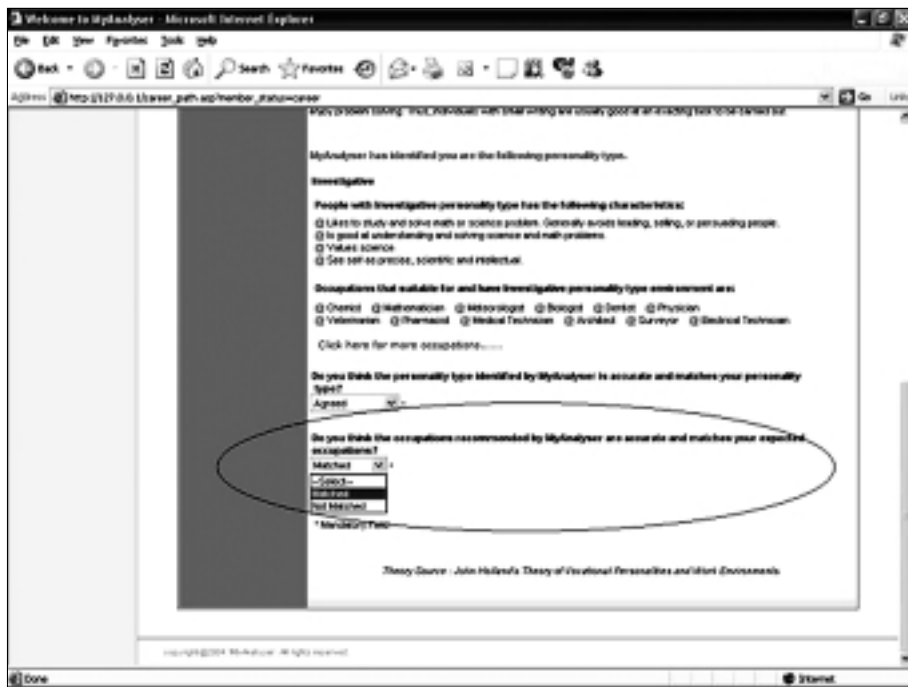

Figure 3. Evaluation Question on the Accuracy of the Occupations Recommended by MyAnalyser.

Table 4 shows the statistics on the accuracy of occupations recommended by MyAnalyser. The statistics show that of the total of 264 participants, 219 (82.95%) participants agreed that the occupations recommended by MyAnalyser match their current or expected occupation. Only 45 (17.05%) disagreed with the occupations recommended by MyAnalyser. Based on the figures, it can be concluded that the occupations recommended by MyAnalyser are accurate.

Table 4. Statistics on the Accuracy of Occupations Recommended by MyAnalyser.

Participants	Accuracy Level	
	Matched	Not Matched
IT Professional in Klang Valley of Malaysia	219	45
Percentage	82.95%	17.05%

FUTURE ENHANCEMENTS

The handwriting analysis results generated are accurate, based on the user evaluation. For further research, MyAnalyser could be enhanced and commercialised to cater to large enterprises or corporate institutions or other users. This could be achieved by designing and incorporating additional functions and features to allow corporate users to create the job profiles for each job vacancy such as personality traits, characters, quality, skills, years of working experience, educational background, working environment, job functions, roles and responsibilities required for the job. Members or applicants are required to conduct the handwriting analysis in MyAnalyser when making a job application. Corporate users can search for applicants who match the job profile or even the members that did not apply for the job but match the job profile based on their handwriting analysis result as well as their other details.

This would mean that MyAnalyser can be enhanced to become an online job recruitment Website as it provides the database that contains data for job vacancies and job seekers. This would benefit the employers in Malaysia as they can save costs and time and prevent high staff turnover by employing the right candidates. Electronic or online job application is booming in Malaysia. Hence, future research can be extended to the existing online job application as well as new concept of online job application Website that comes with personality identification features in Malaysia and other Asia Pacific countries such as China, Singapore, Thailand and Indonesia.

CONCLUSION

Handwriting analysis or graphology is a field of study for identifying and understanding people's personality, behaviours and characters through analysing their handwritings. Handwriting analysis helps a person to understand himself better. By knowing his own personality, a person could choose the occupations, working environments and the job functions, roles and responsibilities that match his personality type. According to John Holland's theory, a person should choose an occupation whose type is the same as, or similar to his/her personality type (Lawrence, 2003).

MyAnalyser was designed based on the John Holland's theory and combination of the French and German's handwriting analysis techniques. MyAnalyser was developed with the objective of using handwriting analysis to identify personality type and recommend suitable occupations.

MyAnalyser was fully tested to ensure that it is error-free and meets the functional and non-functional requirements defined in the requirements analysis. Its accuracy was also analysed. The results of the evaluation show that of the 264 participants, 201 (76.14%) participants agreed that their respective personality type identified by MyAnalyser are accurate, while 219 (82.95%) participants deemed as accurate the occupations recommended by MyAnalyser. This is based on users' feedback during the user evaluation. The accuracy of the results was evaluated based on whether the personality type identified and occupations recommended by MyAnalyser match the users' actual personality type and expected or current occupations, respectively.

System evaluation was carried out after system testing to get the users' feedback on the usefulness as well as the accuracy of the handwriting analysis results. Based on users' feedback, MyAnalyser was rated positively for ease-of-use, usefulness, user satisfaction, good display of information and design. The results of the evaluation show that of the 264 participants, 201 (76.14%) participants agreed that the personality type identified by MyAnalyser is accurate and 219 (82.95%) participants deemed as accurate the occupations recommended by MyAnalyser. This indicates that MyAnalyser has achieved the functional and non-functional requirements defined in the requirements analysis and it has met the research objectives.

In conclusion, MyAnalyser has fulfilled all the research objectives. It has fulfilled the system requirements, functional and non-functional requirements and the results of the evaluation show that the personality type identified by MyAnalyser and the occupations recommended are accurate.

ACKNOWLEDGEMENTS

REFERENCES

Dix, A., J. Finlay, G. Abowd, and R. Beale. 1998. Human-Computer Interaction. 2nd ed. London: Prentice Hall Europe.

Graziano, A. M., and L. D. Raulin. 1997. Research Method: A process of inquiry. 4th Edition. NeedHam Heights, MA: Addison-Wesley Publishing.

Kohn, M. S. 2003. How to create a resume for foreign markets. Career Journal of The Wall Street Journal. [Online]. Available: http://www.careerjournal.com/myc/workabroad/20010524-kohn.html [25 July 2004].

Lawrence, K. J. 2003. The Career Key. [Online]. Available: http:// www.careerkey.org/ english/ you/summary.html [13 August 2004].

Lowe, S.R. 1999. The complete idiot's guide to handwriting analysis. New York: Alpha Books.

Preece, J., Y. Rogers, and H. Sharp. 2002. Interaction Design: beyond human-computer interaction. United States of America: John Wiley & Son, Inc.

RI Software Inc. 2004. Sheila Lowe & Associates. Handwriting analysis software for windows. [Online]. Available: http://www.writinganalysis.com [21 June2004].

Schorr, M. 1999. The Write Direction: Handwriting analysis gains popularity as a way to judge job applicants. Las Vegas Sun. 31st January.

Shelly, G. B., T. J. Cashman, and H. J. Rosenblatt. 2003. System Analysis and Design. 5th ed. Boston: Course Technology.