Study of Issues Regarding Usage of High-Tech Research Instruments in the Faculty of Physical Therapy, Mahidol University

Nattaporn Intawachirarat, Sripair Nookaew, Jarugool Tretriluxana

Abstract

High-tech research instruments have become essential for the development of knowledge and skills in various fields. Currently, technology in the field of physical therapy is expensive and requires users with expertise and specific skills. The Faculty of Physical Therapy at Mahidol University possesses several high-tech research instruments, but some researchers in certain departments do not use them for research and development. Therefore, it is necessary to study ways to use these instruments, the problems that may arise, and the expectations of researchers in the field of physical therapy.

This study surveyed the issues regarding the use of high-tech research instruments in the Faculty of Physical Therapy at Mahidol University using questionnaires. The sample group included students, teachers, and therapists who use high-tech research instruments. The questions in the questionnaire included the background of the researchers, the problems expected, the methods for data analysis, and the interpretation of the data.

From the results of the study, various methods for the management and use of high-tech research instruments in the Faculty of Physical Therapy at Mahidol University can be selected. This will help in reducing human factors in the field of physical therapy and can be used as a reference for the development of research instruments.

Faculty of Physical Therapy, Mahidol University 999 Phuttamonthon 4 Road, Salaya, Nakhon Pathom 73170

การศึกษาค้นหารายการใช้เครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูงของคณะกายภาพบําบัด มหาวิทยาลัยมหิดล

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บทคัดย่อ

เครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูงได้เข้ามามีบทบาทสำคัญในการพัฒนาองค์ความรู้และความสามารถในหลากหลายสาขา ณ ปัจจุบันเทคโนโลยีในสาขาชีวการแพทย์ยังมีราคาแพง และต้องการผู้ใช้งานที่มีความสามารถในเชิงลึกและมีทักษะเฉพาะทางในขณะที่ภาควิชาบําบัด มหาวิทยาลัยมหิดล นั้นมีเครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูงหลายอย่างที่โดดเด่น อย่างไรก็ตามนักวิจัยบางกลุ่มบางส่วนไม่ใช่เครื่องมือวิจัยเหล่านี้ เพื่อการปรับปรุงและพัฒนาเครื่องศึกษาวิธีการใช้งาน ปัญหาที่อาจเกิดขึ้นและความคาดหวังของเครื่องมือวิจัยจากนักวิจัยในสาขาวิชากายภาพบําบัด

การศึกษาครั้งนี้ได้ทำการสำรวจปัญหาเกี่ยวกับการใช้เครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูง ในคณะกายภาพบําบัด มหาวิทยาลัยมหิดล โดยใช้แบบสอบถาม กลุ่มตัวอย่างได้แก่ นักเรียน อาจารย์ และนักบําบัด ที่ใช้เครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูง หัวข้อในแบบสอบถามประกอบด้วยพื้นหลังของผู้วิจัยต่อการใช้งานของอุปกรณ์นั้นๆ ปัญหาร่วมที่อาจเกิดขึ้นคาดหวังการปรับปรุงแนวทางการพัฒนาการใช้งานโดยเฉลี่ย และศักยภาพของเครื่องมือวิจัยอันได้มาตรฐานโดยใช้สถิติเชิงพรรณนา และสถิติเชิงสถิติ

จากผลของการศึกษาที่ได้รับการวิเคราะห์ สามารถสันนิษฐานและใช้เครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูงของคณะกายภาพบําบัด มหาวิทยาลัยมหิดล สามารถใช้ประโยชน์ในการพัฒนาและพัฒนาผู้ใช้เครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูงสำหรับใช้ในการวิจัยได้อย่างมีประสิทธิภาพและประสิทธิผลของนักวิจัย นอกจากนี้การใช้เครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูงในกระบวนการพัฒนาเครื่องมือวิจัยที่มีเทคโนโลยีชั้นสูงของคณะกายภาพบําบัด มหาวิทยาลัยมหิดล สามารถใช้ประโยชน์ต่อการพัฒนาและพัฒนาผู้ใช้เครื่องมือวิจัยข้ามได้ตามที่ได้ที่กำหนด

คณะกายภาพบําบัด มหาวิทยาลัยมหิดล 999 ถนนพุทธมณฑลสาย 4 ต.ศาลายา อ.ทุ่งมหาเมฆ จ.นครปฐม 73170

Faculty of Physical Therapy, Mahidol University 999 Phuttamonthon 4 Road, Salaya, Nakhon Pathom 73170

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ABSTRACT

High-tech research instruments have a vital role to develop the knowledge and capability in several fields. Currently, high-tech research technologies in the biomedical fields are expensive and require in-depth specific skill. In the Faculty of Physical Therapy, Mahidol University, we have several outstanding high-tech research instruments. However, the certain researchers in this faculty do not favor to use these research instruments. To improve these, we should study the usability, potential issues, and expectation of research instruments from researchers in the physical therapy fields. There are significant of realizing and managing approach to provide superior operation, interaction, and inspiration.

This study has surveyed the issues regarding usage of high-tech research instruments in the Faculty of Physical Therapy, Mahidol University by using the questionnaire. A sample group is the students, instructors, and therapists that used the high-tech research instruments. The topics in a questionnaire consist of the subject's background, the instrument usability, the potential issue, the expectation for development approach. The average data interpreted into three levels of the Likert scale by use three criteria for interpretation: agreement, uncertainty, and disagreement. Finally, the results conclude descriptive statistics by using percentage, average, and standard deviation.

From the results, they provide useful appropriate approach for managing high-tech research instruments in the Faculty of Physical Therapy, Mahidol University. Hence, the operation and the specification of high-tech research instruments decide to use appropriately regarding researcher's experience. Moreover, the human factors of researchers in the physical therapy fields regarding high-tech research instruments are obtained for developing the research instrument.

Key words: Biomedical instrument, Physical therapy
E-mail address: nattaporn.int@mahidol.ac.th

Introduction

Background

High technology of research instruments has a vital role to develop the knowledge and capability in several fields. Therefore, the end user should have the essential skills for operating and troubleshooting those high-tech instruments. Currently, high-tech technologies in the biomedical fields
are expensive and require specific skills. Hence, the operation and specification of high-tech instruments should decide for using appropriately regarding user's experience.

In the Faculty of Physical Therapy, Mahidol University, they have several outstanding high-tech research instruments and have strategic plan to be excellent by research. However, certain users in this faculty do not favor to use regarding these research instruments. To improve these, the authors have planned to study the usability, the potential issues, and the expectation of research instruments from users in the physical therapy fields. There are significant of realizing and managing approach to provide superior operation, interaction, and inspiration for users in the Faculty of Physical Therapy, Mahidol University.

Objectives

- To study the potential issues of research instruments from users in the Faculty of Physical Therapy, Mahidol University
- To study the expectation for development approach of research instruments from users in the Faculty of Physical Therapy, Mahidol University
- To exhibit the appropriate managing approach of research instruments for administrators in the Faculty of Physical Therapy, Mahidol University

Scope

Use the questionnaire to study usage's behaviors of high-tech research instruments from students, instructors, and therapists in the Faculty of Physical Therapy, Mahidol University.

Expected Benefits

- Human factors of researchers regarding research instruments in the physical therapy fields.
- Appropriate approach for managing research instruments at the Faculty of Physical Therapy, Mahidol University.

Literature Review

The questionnaire is widely used in the survey as a research tool. Nowadays, it becomes capability that is the most popular because it directly derived information from the actual. Hence, the information is reliable and up to date to solve problems, set policy, and plan development. Two advantages of the questionnaire are a collection of query data allows the data is the same manner or style (uniformity), and the information is the same manner as the original (primary data) [1].

Questions of the survey research can classify into three structures: closed-ended, open-ended, and contingency questions [2]. From the conditions of easy to answers, specific questions, and no difference between articulate and inarticulate respondents, the closed-ended questions are the
best adoption. The color of the questionnaire has effected on response rate. The most effective color is purple regarding both of genders, all age groups, and each response wave [3].

The practice of evaluating interaction with technology is embedded in disciplines such as human-computer interaction, cognitive ergonomics, error analysis, skill rule, knowledge based behavior, and resolution can provide biases [4]. The impact from understanding technology on the end user is an importance human factors that should realize. The factors that should focus in design to be the criteria for implementation processes consist of organizational factors, technology factors, job factors, and individual factors [5].

Methodology

This study has surveyed the issues regarding usage of high-tech research instruments in the Faculty of Physical Therapy, Mahidol University by using the questionnaire. All methods will describe as follow steps.

Data Collection

A sample group is the students, instructors, and therapists of the Faculty of Physical Therapy that used the high-tech research instruments. There are target populations (N) about 70 people (October 2012). Therefore, it can calculate a sample size (n) by giving level of precision (e) equal 0.05 from the Yamane’s formula [6]:

\[ n = \frac{N}{1 + N(e)^2} = \frac{70}{1 + 70(0.05)^2} \approx 60 \text{ people} \]

Questionnaire has three main parts as shown in Figure 1. First part is checklists and yes-no questions of the subject’s background and the instrument usability. Second part is rating scales of the potential issue and the expectation for development approach. They are designated into five scales consisting of: 5 is strongly agree, 4 is agree, 3 is uncertain, 2 is disagree, and 1 is strongly disagree. Last part is comments and suggestions on the instrument usability, the potential issue, the expectation for development approach, and others.

Content validity of this questionnaire was approved by three experts in several fields from Mahidol University consisting of: Assoc. Prof. Somboon Sirisunhirun, Ph.D. from the Faculty of Social Sciences and Humanities, Asst. Prof. Jarugool Tretriluxana, Ph.D. from the Faculty of Physical Therapy, and Asst. Prof. Jackrit Suthakorn, Ph.D. from the Faculty of Engineering.

Relative validity of this questionnaire has obtained by examining on two subjects of non-target group in two trials. The average precision is 83.33 percentages.
Data Analysis

The average data will interpret into three levels of the Likert scale. Subsequently, use these criteria for interpretation [6]:

\[
\text{The width of the interval} = \frac{\text{Score}_{\text{Max}} - \text{Score}_{\text{Min}}}{\text{Scale}} = \frac{5 - 1}{3} = 1.333
\]

If the average data is in the range of 3.668 – 5.000 points that interprets the agreement.
If the average data is in the range of 2.334 – 3.667 points that interprets the uncertainty.
If the average data is in the range of 1.000 – 2.333 points that interprets the disagreement.

Finally, the results will conclude descriptive statistics by using percentage (\%), average (\(\bar{X}\)), and standard deviation (SD).

Results

First wave of collected results is from the subjects that doing the research in motion analysis track. The usually high-tech research instrument that they used is the Vicon motion capture system. This system consists of the AMTI force plates, the Bonita Optical cameras, and the Noraxon EMG.
sensors. Sixty percentages of these subjects are the instructors and the rests are master degree's students. The average time spent from all subjects is about 3.30 hours per time.

The results in the section of source of instrument usability are shown:

- All subjects have learnt from class.
- Sixty percentages of subjects have read the advertised brochure, and the rests did not.
- Sixty percentages of subjects have read the manual in depth, and the rests did not.
- Sixty percentages of subjects have attended the training course, and the rests did not.
- All subjects usually read the research article or technical note.
- All subjects usually ask the expended person.
- All subjects usually search from the internet.

The results in the section of list of potential issues are shown:

- From a wording of “there are sufficient instruments for users”, it got 4.8 points of average data that interprets the agreement.
- From a wording of “user has basic knowledge and skill”, it got 4.2 points of average data that interprets the agreement.
- From a wording of “it has taken short time for learning curve”, it got 2.8 points of average data that interprets the uncertainty.
- From a wording of “hardware performance is perfect”, it got 4.0 points of average data that interprets the agreement.
- From a wording of “software performance is perfect”, it got 3.4 points of average data that interprets the uncertainty.
- From a wording of “it is easy to use”, it got 2.4 points of average data that interprets the uncertainty.
- From a wording of “there is enough technical assistance”, it got 3.6 points of average data that interprets the uncertainty.

The results in the section of expectation for development approach are shown:

- From a wording of “it is lightweight and has comfortable size”, it got 2.6 points of average data that interprets the uncertainty.
- From a wording of “instrument preparation is fast and easy to set up”, it got 3.6 points of average data that interprets the uncertainty.
- From a wording of “instrument instruction is practical and easy to use”, it got 3.6 points of average data that interprets the uncertainty.
- From a wording of “Graphical User Interface (GUI) is intuitive and attractive”, it got 4.2 points of average data that interprets the agreement.
• From a wording of “result illustration is efficient and useful”, it got 4.8 points of average data that interprets the agreement.
• From a wording of “it has more confidence on safety issue”, it got 4.8 points of average data that interprets the agreement.
• From a wording of “it is compatibility with other instruments”, it got 4.8 points of average data that interprets the agreement.

Discussion and Conclusion

High technology of research instruments have required time for learning curve. Hence, they are not easy to use for the basic user. Instrument preparation, instrument instruction, and software performance have provided some issues for users. All users like the instrument that is lightweight and has comfortable size.

Almost subjects have studied for using the high-tech research instrument in several sources. However, they still have some complicated issues regarding those instruments. There are occurred because the behavior background of the normal therapist in Thailand. Perchance, if they have enough the suitable technical assistance to support and advice, these issues will decrease.

From the results, they provide useful appropriate approach for managing high-tech research instruments in the Faculty of Physical Therapy, Mahidol University. Hence, the operation and the specification of high-tech research instruments decide to use appropriately regarding researcher’s experience. Moreover, the human factors of researchers in the physical therapy fields regarding high-tech research instruments are obtained for developing the research instrument.

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