User Satisfaction Survey on the Implementation of Pharmacy Information System and Clinic Pharmacy System (PhIS & CPS) in Ministry of Health Malaysia Facilities

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Abstract

Introduction: The Ministry of Health (MOH) Malaysia implemented the Pharmacy Hospital Information System and Clinic Pharmacy System (PhIS & CPS) with an aim to strengthen the monitoring of procurement, supply, and use of medicines at MOH facilities. It allows patient drug profile sharing to provide seamless patient care, as well as to serve as a tool in making decisions to ensure the accessibility of medicines by consumers in the MOH facilities. As PhIS is meant to improve the delivery of pharmacy services, it is crucial to evaluate users' perceptions and allow for continuous improvement accordingly.

Objective: This study aimed to identify the level of PhIS & CPS users' satisfaction with the system implementation in the facility.

Method: A cross-sectional study using a self-administered questionnaire was conducted in government healthcare facilities using universal sampling. The HOT-fit framework was employed to analyse the level of users' satisfaction in the human, organisation, and technology domains of system implementation. Descriptive analysis was performed to tabulate the category of users, the system's training received, and their level of satisfaction.

Results: A total of 4,265 responses were analysed indicating a 14.3% valid response rate, more than half of which are pharmacy-related staff. Overall, more than 73% of users had one to five years of experience in using the system, 84% of total users are pharmacy-based system users, and only 55% of users have attended a form of formal system's training. On a scale of 1 to 5, the level of users' satisfaction across all measured factors was generally satisfactory (mean scores were between the range of 3.66 – 4.13), with the human domain having more dissatisfaction and indifferent responses (38%).

Conclusion: The level of satisfaction among the system's users was generally satisfactory, but improvements can be made in targeted areas of concern.

Keywords: pharmacy information system, clinic pharmacy system, user satisfaction

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Introduction

The Pharmacy Hospital Information System and Clinic Pharmacy System (PhIS & CPS) was implemented by the Pharmaceutical Services Programme (PSP), Ministry of Health (MOH) Malaysia to monitor the procurement, supply and use of medicines at MOH facilities (1). This comprehensive system integrated pharmacy-related services and clinical workflows to allow patient-drug profile sharing and provide seamless patient care, as well as a tool in making decisions to ensure rational use and access to medicines (2).

The PhIS & CPS implementation began in 2013, albeit the expansion of usage in all government facilities in the country was gradual and by stages. The PhIS & CPS application has four different integrative modules namely full-based, pharmacy-based, inventory-based and indent-based modules. The types of module implementation heavily depend on the infrastructure and organisational capacity of a facility. Indent- and inventory-based modules focus mainly on the procurement of products and inventory management of stocks, while the pharmacy- and full-based modules comprise of the same functions and applications with differences only in the online drug prescribing workflows (1). The generic functions and components of a hospital information systems (HIS) and PhIS & CPS have been extensively reviewed in several local studies (3-6). As of June 2022, a total of 1,274 facilities has implemented the system. The pharmacy-based module has been implemented in over 65% of MOH facilities while the indent- and inventory-based modules have been implemented in 17% and 11% facilities respectively (7).

HIS are particularly designed to facilitate healthcare providers in managing the medication processes safely (8). As PhIS & CPS was designed to improve the delivery of pharmacy services, it is crucial to evaluate the overall systems performance, users' perception and satisfaction, and the improvements it has contributed to the Malaysian healthcare system. Studies in this area was still lacking and the Pharmacy Research Priorities in Malaysia document highlighted the need for an emphasis in this segment of pharmacy research (9).

Effective and continuous use of HIS provide better access and systematic data management compared to the manual paper-based system (10). The measure of net benefits of HIS implementation involves a multitude of interrelated factors. A HOT-fit framework developed by Yusof *et. al* provided a comprehensive categorisation of evaluation factors and domains that fit and corresponded to specific dimensions within the human (H), organisational (O), and technology (T) domains of HIS implementation success (11,12). This framework can be adapted to assess specific areas of concern that may contribute to a disruption in the whole workflow (12,13,14).

The focus of this study was to quantify the level of users' satisfaction on the PhIS & CPS by adopting the HOT-fit model (12). In the context of this research, user satisfaction was defined as the basic concept of information evaluation as a response to the user's intellectual and emotional judgement (15). The outcome of this research will provide an insight on the types of users and their level of satisfaction. The findings may assist the PhIS & CPS project team to identify the problematic areas and strategise action plans to improve the system.

Method

Study Design

A descriptive cross-sectional study using self-administered questionnaire was conducted in the MOH government healthcare facilities from 2 September to 24 October 2021. Universal sampling method was employed by distributing the online questionnaires to all PhIS & CPS users nationwide that fulfilled the inclusion criteria of this study. The registered e-mail addresses of users were extracted from the system database, including and not limited to doctors, nurses, registration clerks, pharmacists, assistant pharmacists and storekeepers. Exclusion criteria were inactive or dormant users, and registered system users of less than three months. This was to avoid bias that could potentially be introduced by new users due to insufficient system familiarisation. Personal information of respondents was not collected in the study. A statement of consent was prompted in the distributed questionnaire and respondents who selected not to agree with the terms of the study was automatically redirected to the end-page of the questionnaire and excluded from the study. This study was approved by the MOH Medical Research and Ethics Committee (MREC) with the National Medical Research Registry (NMRR) registration number of NMRR-20-2657-57102.

Questionnaire

The questionnaire was developed in Malay language as it was the unified national language in the Malaysian public sector (16). The questionnaire comprised of two parts, where the first part collected demographic information, and the second part contained questions to measure the level of users' satisfaction based on three main domains of the HOT-fit model [human (H), organisation (O), and technology(T)) and the respective sub-domains (H: system development and system use; O: organisational structure; T: system quality, information quality, and service quality) as depicted in Figure 1 (12). The questionnaire was constructed through rigorous expert panel discussions and designed to measure relevant functions that were deemed critical to the system. The detailed domains and questions were illustrated in the Appendix.

A pilot study was conducted among 11 selected users of the system. The internal consistency by Cronbach's alpha (α) for each sub-domain were 0.86 for system development, 0.84 for system use, 0.96 for organisational structure, 0.92 for system quality, 0.96 for information quality, and 0.95 for service quality. Therefore, all Cronbach's alpha scores were acceptable for the developed construct (17). The pilot study results were excluded in the final analysis.

Descriptive Statistical Analysis

Compilation and tabulation of data was performed using Microsoft Excel version 2019 and IBM SPSS version 28. Descriptive analysis was conducted to assess the characteristics of respondents and the types of training attended, expressed in frequencies and percentages. The level of users' satisfaction was measured using a five-point Likert scale. Scores were assigned to the answers, in which 1 = strongly dissatisfied; 2 = dissatisfied; 3 = neither; 4 = satisfied; 5 = strongly satisfied. The mean and standard deviation (SD) of the scores were calculated with the highest possible mean score being 5.00 and lowest possible mean score was 1.00. The scores were classified into low, neutral, and high level of satisfaction by dividing the difference between the highest and lowest possible mean score by 3 to give an interval of 1.33 (low = 1.00-2.33, neutral = 2.34-3.67, high 3.68-5.00) (18).

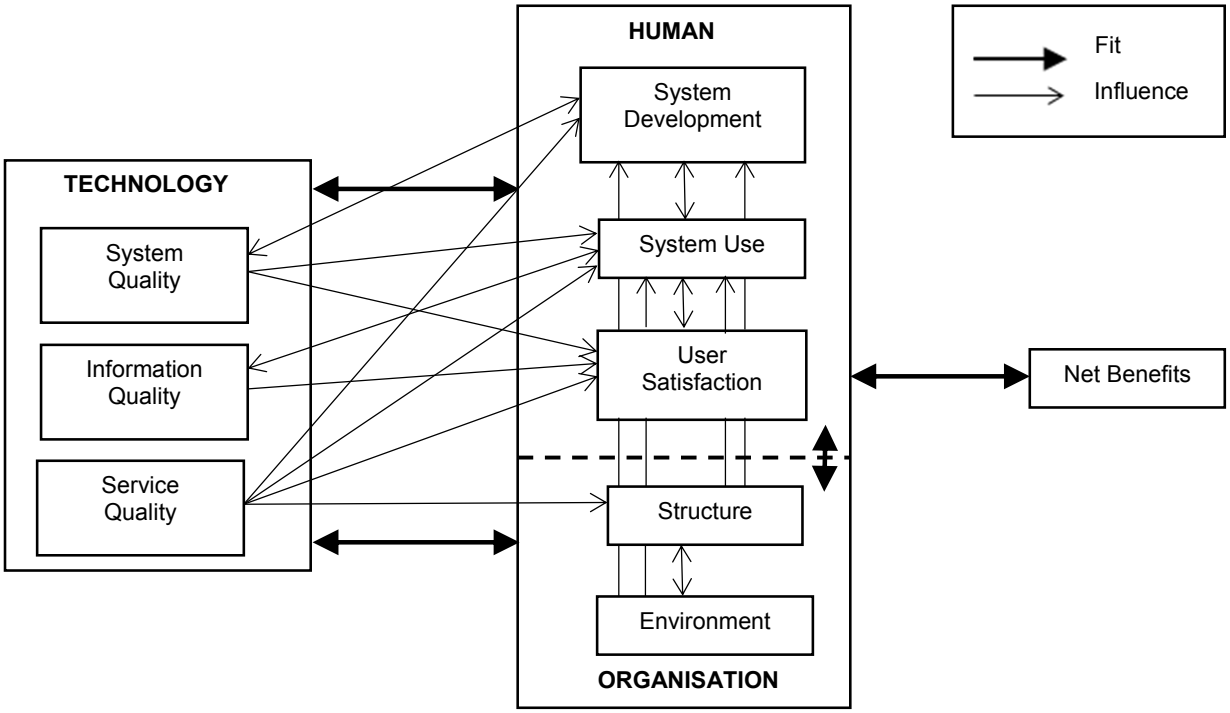


Figure 1: Human-Organisation-Technology Fit (HOT-fit) framework (12)

Results

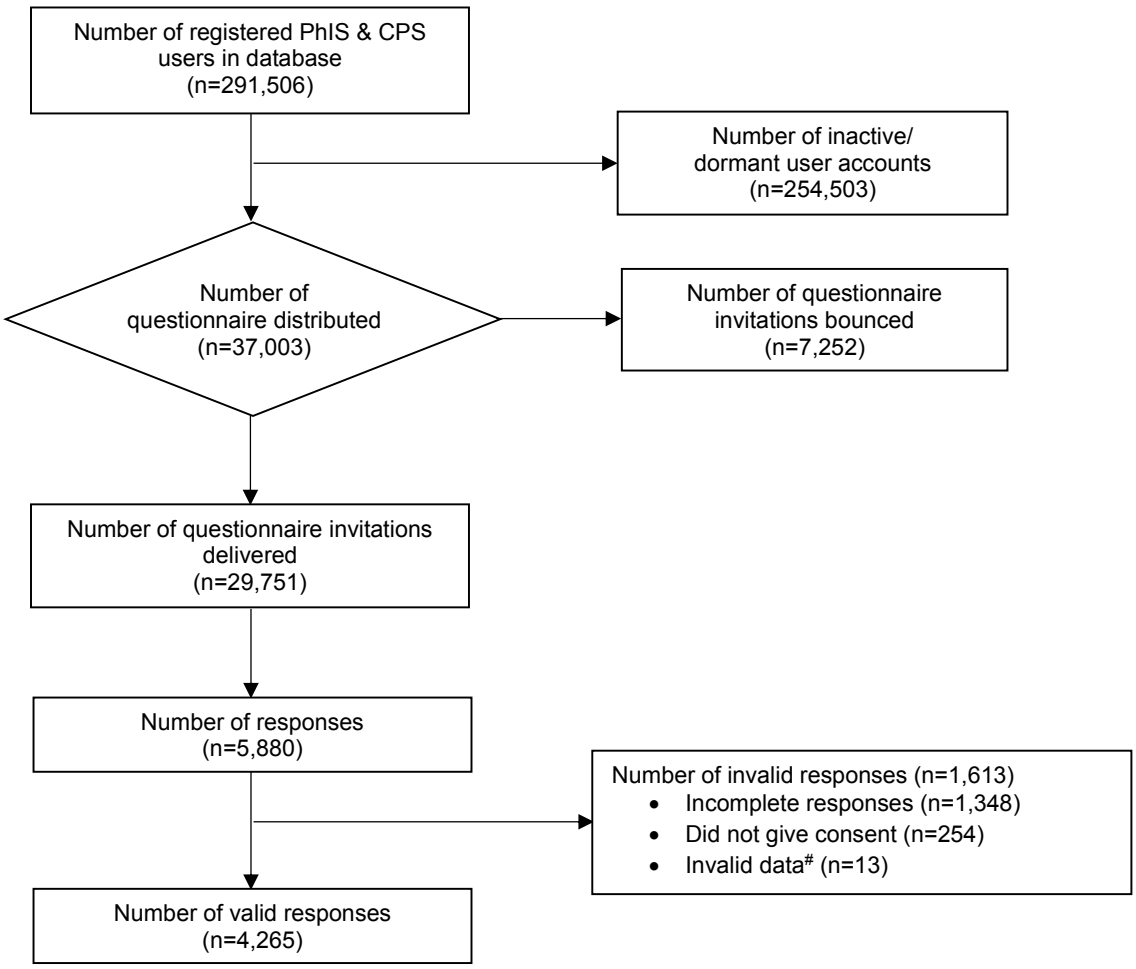
The system database consisted of a total of 291,506 registered PhIS & CPS users, whereby 254,503 of which were inactive and dormant users. The questionnaire invitations were distributed to 37,003 active users but 7,252 invitations were automatically bounced indicating invalid e-mail addresses. The questionnaire invitations delivery acknowledgement notifications received was 29,751. However, the number of responses received was 5,880 (19.8% estimated response rate) with 1,613 invalid responses due to incomplete forms, respondents disagreeing to the terms of the study, and invalid data. The final valid responses included in this study for further analysis was 4,265 (14.3% actual response rate). A breakdown of calculated responses and the final number of valid responses used for the analysis was depicted in Figure 2.

The characteristics of respondents were tabulated in Table 1. The mean age of users was 34.4 years old (SD 7.11 years) and 73.4% of users had about one to five years of experience in using the system. Majority of users (84.1%) were using the pharmacy-based systems, and more than half of the respondents were of pharmacy-related staffs, followed by the nurses (30.2%).

Table 2 summarised the crosstabulation of respondents' professions and their system's training experience. Majority of pharmacists and pharmacist assistants, and about half of the houseman medical officer respondents have attended a PhIS & CPS training and was personally trained by the vendor. More than half of the nurses did not attend any formal training, and 40% claimed to have undergone on the job training or initiated self-learning.

The mean scores on the level of user satisfaction based on the measured sub-domains were summarised in Table 3. The mean score of satisfaction towards the measured sub-domains indicated a high level of satisfaction (mean score of above 3.68) except for the sub-domain of system use (user perception, training, and access) which indicated a neutral level of satisfaction (3.66, SD 0.66). As for user specific functionalities, administrative assistants rated highest for system's quality with a mean score of 4.13 (SD 0.64).

Generally, the overall level of satisfaction across all domains (human, organisation, and technology) were satisfactory (Figure 3). The overview of overall satisfaction based on users' profession (Figure 4) showed that staffs of the medical profession expressed more dissatisfaction towards the system, while administrative assistants were mainly satisfied with the PhIS & CPS.



Invalid data includes errors in respondent's age, position, and place of work

Figure 2: The breakdown of questionnaire responses and the calculated final valid responses

Table 1: Characteristics of respondents (n=4,265)

Characteristics	n (%) / mean ± SD
Age, years, mean ± SD	34.4 ± 7.11
Age group, n (%)	
20 – 29 years	1166 (27.3)
30 – 39 years	2158 (50.6)
40 – 49 years	771 (18.1)
50 – 59 years	170 (4.0)
User experience, years, mean ± SD	4.47 ± 2.05
User experience category, n (%)	
< 1 year	313 (7.3)
1 – 5 years	3132 (73.4)
> 5 years	820 (19.2)
Types of PhIS & CPS system implementation, n (%)	
Full-based	508 (11.9)
Pharmacy-based	3587 (84.1)
Inventory-based	137 (3.2)
Indent-based	33 (0.8)
Position of user, n (%)	
Pharmacist	1847 (43.3)
Pharmacist Assistant	502 (11.8)
Provisionally Registered Pharmacist	97 (2.3)
Medical Officer	171 (4.0)
Assistant Medical Officer	265 (6.2)
Houseman Medical Officer	17 (0.4)
Nurse	1290 (30.2)
Administrative Assistant	76 (1.8)

Table 2: Crosstabulation of respondents' positions and system's training, n (%)

	Has the respondent attended a system's training? (n=4,265)		If Yes (n=2,357), by whom?		
Position	No	Yes	Champion	Vendor	Self-Learning
Pharmacist	658 (36)	1189 (64)	335 (28)	723 (61)	131 (11)
Pharmacist Assistant	90 (18)	412 (82)	81 (20)	279 (68)	52 (13)
Provisionally Registered Pharmacist	77 (79)	20 (21)	3 (15)	4 (20)	13 (65)
Medical Officer	112 (65)	59 (35)	12 (20)	21 (36)	26 (44)
Assistant Medical Officer	168 (63)	97 (37)	24 (25)	34 (35)	39 (40)
Houseman Medical Officer	8 (47)	9 (53)	2 (22)	5 (56)	2 (22)
Nurse	753 (58)	537 (42)	85 (16)	235 (44)	217 (40)
Administrative Assistant	42 (55)	34 (45)	6 (18)	20 (59)	8 (24)

Table 3: Overall satisfaction scores of PhIS & CPS system users based on the sub-domains

Sub-domain	n	mean ± SD
System development	4265	3.69 ± 0.67
System use	4265	3.66 ± 0.66
Organisational Structure	4265	3.75 ± 0.64
Quality of service	4265	3.84 ± 0.61
Information quality (PF, PPF, & PRP)	2446	3.85 ± 0.64
Quality of system (PF, PPF, & PRP)	2446	3.98 ± 0.59
Quality of system (MO & HMO)	188	3.86 ± 0.75
Quality of system (SN & AMO)	1555	3.98 ± 0.65
Quality of system (PT)	76	4.13 ± 0.64
Overall quality of system	4265	3.81 ± 0.63

Abbreviations: PF - Pharmacist; PPF - Pharmacy Assistant, PRP - Provisionally Registered Pharmacist; MO - Medical Officer; HMO - Houseman Medical Officer; AMO - Assistant Medical Officer, SN - Nurse; PT - Administrative Assistant

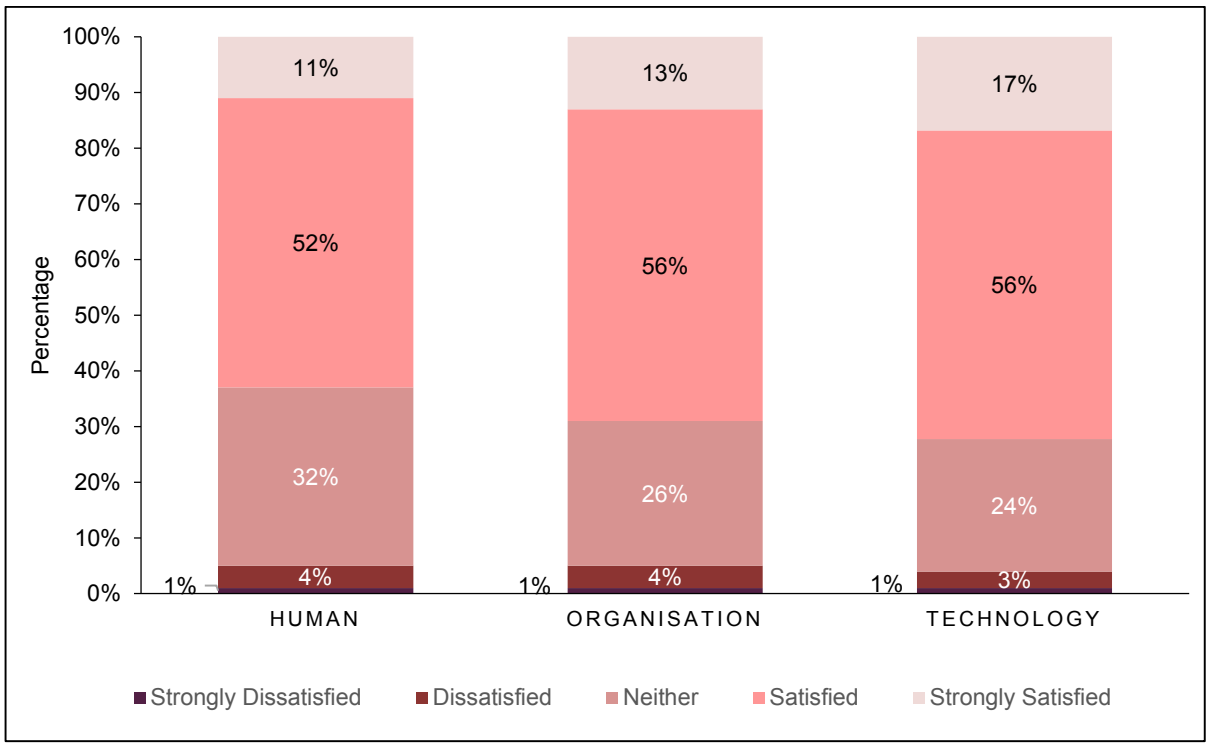


Figure 3: Percentage of overall satisfaction level of PhIS & CPS system users by domain

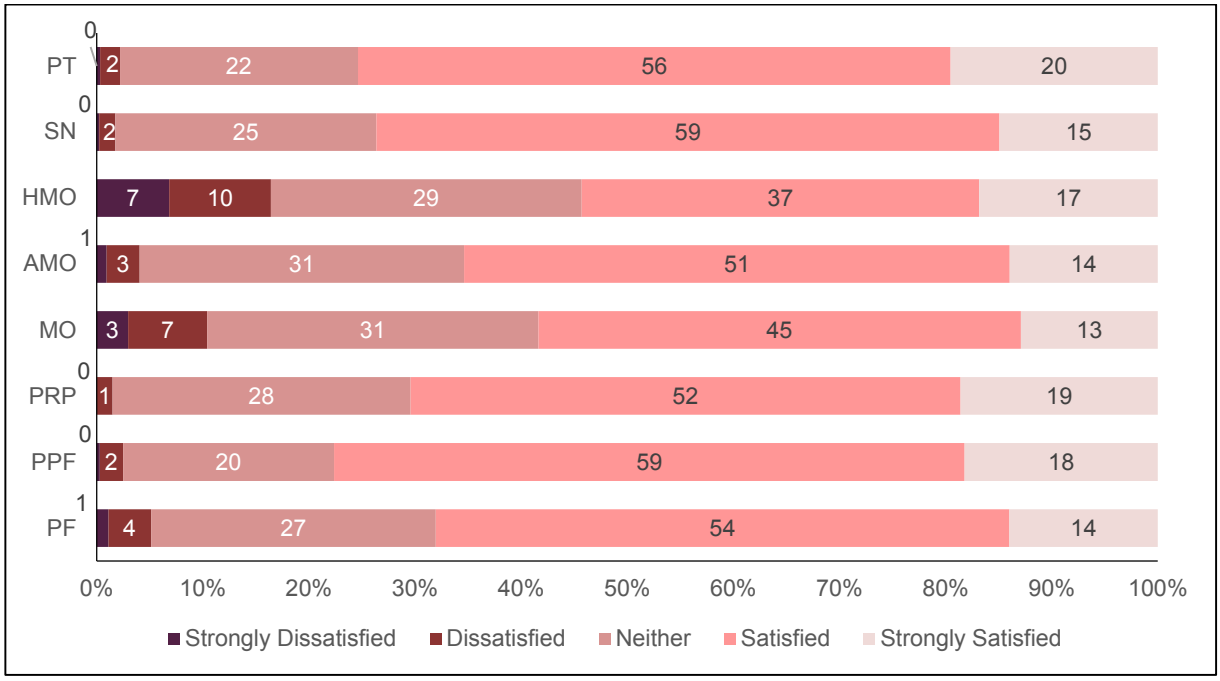


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Figure 4: Percentage of overall satisfaction level of PhIS & CPS system users by position

Discussion

The PhIS & CPS users' perception and satisfaction are the key drivers to an effective and continuous use of the system which could give an indication to the success of system implementation (19,20,21). Since the system was largely designed to cater for the pharmacy-related administrative functions, and management of clinical and pharmaceutical information, the largest group of respondents observed in this study were mainly pharmacists. However, the indentation of medicines and medical supplies from the main store to respective units and departments are commonly performed by nurses or assistant medical officers, hence they are also deemed as frequent users of the PhIS & CPS.

The pharmacy-based module had the highest number of implementations in the country, hence the high number of respondents utilising this module. The modules implemented were particularly dependent on the organisational and infrastructure of the facility, such that indent-based modules were mostly implemented in rural and sub-urban small-sized health clinics that have limited number of staffs in the facility. The inventory-based modules were implemented in facilities to complement their existing HIS applications, while pharmacy-based modules were implemented in facilities that do not have HIS in place and were previously manual, paper-based systems. Full-based module was developed as a full-fledged hospital management information system comprising of the whole clinical management workflow from patient management processes, prescribing of medicines, dispensing, registration, procurement, stock management and reporting (3). The critical function of PhIS & CPS is the component to procure and indent pharmaceutical products and medical supplies. The networking of this component across all facilities enabled monitoring and continuous access to pharmacy services under the governance of PSP.

The realisation of the system's net benefit depends on effective use of the system and the fulfilment of the end-user requirements. Many research had recognised the end-user satisfaction and system usage as the critical determinants of the success of information systems (21,23-25). The utilisation of the HOT-fit framework enabled a seamless categorisation of essential dimensions and measures for evaluating HIS. A qualitative study by Ismail *et al.* utilised the HOT-fit framework in assessing PhIS users' satisfaction in 2016 during the early stages of PhIS & CPS implementation (14). The study noted that the users were aware of the limitations in the system's functions and the unfeasible system upgrades, and that their level of satisfaction could be increased if the quality aspects of the information system, the service provider, system's overall usability, and system's training and communication are improved (14).

Following the study by Ismail *et al.*, this present study provided a quantitative assessment on the level of users' satisfaction based on similar domains and factors, five years after the system was implemented. Generally, the overall satisfaction towards the human, organisational and technological domains were satisfactory. The mean scores of each sub-domain indicated high level of satisfaction with an exception in the system use sub-domain. This sub-domain measured the users' perception, training and access, which reported a neutral score of 3.66 (SD 0.66), indicating room for further improvements. A local study in a tertiary hospital setting analysed PhIS users' acceptance based on perceived usefulness and perceived ease of use among pharmacists and pharmacist assistants by adopting the Davis' Technology Acceptance Model (TAM) (26,27). The study observed a positive attitude towards the system usefulness, but a more neutral attitude towards perceived ease of use. These two measures fall under the human (system use) and technology (system quality) domains respectively, based on the HOT-fit model used in this study. Comparable to that research, our findings observed a more neutral mean score for system use, indicating a lower level of satisfaction compared to other factors being measured. The perceived ease of use, which falls under the measure of overall system quality, reported a mean score of 3.81 (SD 0.63) with administrative assistants having the highest level of satisfaction, and medical officers and houseman medical officers having the lowest. This was in line with another study which found that physicians in Taiwan indicated that perceived ease of use influenced HIS acceptance significantly more that perceived usefulness (28).

A closer look at the level of satisfaction across all domains, the human domain had higher percentage of dissatisfaction and indifferent judgement compared to other domains. Between the two factors measured in the human domain (system development and system use), the latter had a lower mean score. Possible justification to this was over 45% of respondents had not attended any form of formal system's training and of these respondents, more than half were medical officers, assistant medical officers, nurses, and administrative assistants. This could be mitigated by providing system trainings to all new users of the system rather than focusing only on pharmacists and pharmacist assistants. Training was identified as one of the key factors responsible for ensuring successful systems usage in several studies (28,29). Inadequate training causes residual problems and unmet expectations leaving users with a general feeling of dissatisfaction (29). However, due to the user-specific functionalities and applications of the PhIS & CPS, it is difficult to generalise the training modules and courses to accommodate a wider audience. Segmented training courses could be implemented targeting different types of system users, but this requires a thorough and organised planning.

The authors had identified several limitations in this study. The questionnaire was disseminated through work email addresses and reminder notifications were only sent twice throughout the questionnaire distribution period. Hence, users who were on study and maternity or parental leaves, or those who were away from work during this period might not have access to their work emails. The user's response to the questionnaire was on a voluntary basis hence it was difficult to get a high response rate. The small number of respondents for certain professions such as houseman medical officers (0.4%), administrative assistants (1.8%) and provisionally registered pharmacists (2.3%), made it inapt to draw a conclusive representation of the user's profession to their level of satisfaction towards the implementation of PhIS & CPS. Further research is warranted to analyse the level of satisfaction based on profession-specific PhIS & CPS users for targeted system improvements, and to explore the contributing factors that may directly influence the users' satisfaction towards the system.

Conclusion

The aim of implementing the PhIS & CPS was to establish a platform of organised healthcare information and support evidence-based practice to ensure sustainable access to medicines. The system users' satisfaction is the key driver to an effective and continuous use of the system. This study identified that users were generally satisfied with the overall system implementation but indicated that there were room for improvements especially in the human domain. A key concern identified in this study was the inadequacy of system's formal training to a certain segments of users. Further studies should focus on identifying specific areas of concern relating to system's module implementation for a better understanding of challenges faced by individual segments of users.

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Conflict of Interest Statement
The authors declare no conflicts of interest in this work.

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Appendix: Questionnaire design based on selected measures

Domain	Sub-domains	Measures	Target Respondents (Number of questions)
Human	System Development	- System enhancement - System maintenance	All users (3)
	System Use	- User perception - User training - User access	All users (6)
Organisation	Structure	- Guidelines and work processes - Administrative management - IT infrastructure	All users (7)
Technology	System Quality	- Ease of use - System usability - System accessibility - System reliability - System feature usefulness - System integration	All users (8) User-specific questions: - PF, PPF, PRP (6) - MA, HMO (5) - SN, AMO (4) - PT (4)
	Information Quality	- Usefulness - Reliability	User-specific questions: - PF, PPF, PRP (6)
	Service Quality	- Technical support - Responsiveness	All users (14)

Abbreviations: PF - Pharmacist; PPF - Pharmacy Assistant, PRP - Provisionally Registered Pharmacist; MO - Medical Officer; HMO - Houseman Medical Officer; AMO - Assistant Medical Officer, SN - Nurse; PT - Administrative Assistant