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The Development and Evaluation of an Autism Children Technical System (ACTS) of Hadramout Foundation for Autism, Hadramout, Yemen

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ABSTRACT

Hadramout Foundation for Autism (HFA) is a Yemeni foundation established to train, rehabilitate, educate, and serve the children with disabilities, such as autism, down syndrome, and learning difficulties. In 2012, HFA started under the auspices of 50 children, while recently the number of children exceeded 200. The existing system used by HFA for managing the information of autism children suffers from different problems that negatively impact their works' effectiveness and efficiency. Having a comprehensive system for managing the technical aspects of autism children could help to plan, control, and evaluate autism in Yemen. Nevertheless, to date, there has not been any system developed for autism children. Therefore, the aim of this study is to develop an Autism Children Technical System (ACTS) for HFA. To do so, the Agile Kanban method was employed, as it has lately received a significant importance and usage in developing numerous systems and applications within software companies. Particularly, three key phases, which are (1) problem identification, (2) system development, and (3) system evaluation, were carried out. Consequently, ACTS was developed based on the requirements gathered from HFA management and staff. To do so, three techniques, which are Node.Js, Angular, and Nest.js, were used in addition to MySQL as the database platform. Finally, five participants of staff, who involved in daily managing childrens' data, have participated in the usability evaluation of the ACTS. The results show constructive response from the participants on the usefulness and ease of use of the ACTS.

الخلاصة

مؤسسة حضرموت للتوحد (HFA) هي مؤسسة يمنية تهدف إلى تدريب، تأهيل، تعليم، وخدمة الأطفال ذوي الإعاقات، مثل التوحّد، متلازمة داون، وصعوبات التعلم. في عام 2012، بدأت HFA عملها ب 50 طالبا، بينما حاليا تجاوز عدد الطلاب 200 طالبا. إن النظام الحالي الذي تستخدمه HFA لإدارة معلومات الأطفال المتوحدين يعاني من مشاكل مختلفة والتي بدورها تؤثر سلبا على كفاءة وفاعلية العمل. إن امتلاك نظام شامل لإدارة الجوانب التقنية للأطفال المتوحدين سيساعد في التخطيط، التحكم، والتقييم للمتوحدين في اليمن. ولكن، إلى اليوم، لم يتم تطوير أي نظام للأطفال المتوحدين. ولذلك، تهدف هذه الدراسة إلى تطوير نظام تقني للطلاب المتوحدين (ACTS) لمؤسسة حضرموت للتوحد (HFA). ولتحقيق هذا الهدف، تم توظيف طريقة أجايل كانبان، لأنها حظيت مؤخراً باهتمام واستخدام كبير في تطوير الأنظمة من قبل شركات البرمجيات. وبالتحديد، تم تنفيذ ثلاث مراحل أساسية، وهي (1) تحديد الفجوة، (2) تطوير النظام، و (3) تقييم النظام. وعليه، تم تطوير ACTS بالاعتماد على المتطلبات التي تم تجميعها من إدارة وموظفي HFA. ولعمل ذلك، تم استخدام ثلاث تقنيات، وهي Node.Js، Angular، و Nest.js، بالإضافة إلى MySQL كمنصة لقاعدة البيانات. ختاماً، خمسة مشاركين، من الموظفين اللذين يشاركون يومياً في إدارة بيانات الأطفال، شاركو في تقييم قابلية الاستخدام لـ ACTS. كشفت نتائج التقييم عن انطباع إيجابي من المشاركين حول فائدة وسهولة استخدام ACTS.

5. INTRODUCTION

Autism is a spectrum of strongly related disorders with a common core of symptoms [1]. It appears in early childhood, causing delays in several important areas of development like learning to speak, move, and interact with others [2]. Hadramout Foundation for Autism (HFA) is a Yemeni foundatiom which is established on 2012 and located in Mukalla city, Hadramout. HFA aims to train, rehabilitate, educate and serve the children

with special needs and their families. It focuses on implementing projects for the rehabilitation and training for autism centers and societies in Hadramout according to the latest educational methods and with the participation of accredited specialists from outside Yemen [3].

HFA started under the auspices of 50 children with disabilities, and the number of children increased to 120 in 2015, while the number reached 197 children in 2023. HFA celebrated the graduation of more than 60 of its children and enrolled in public schools and more than 20 children to qualify the professional to practice their lives normally. However, the number of reserve children from those wishing to join the foundation has recently reached more than 200 children. The foundation is unable to receive them due to lack of the capacity of the current building and the absence of an operational budget. Mainly, HFA consists of three main departments, in which the employees are distributed, including children and training teams, as follows: (1) The department of autism: which is considered as the largest section and includes 153 children. (2) the department of down syndrome, which includes 20 children. (3) the department of learning difficulty, which includes 24 children. Figure 1 shows HFA building [3].

Figure 1: HFA Building

Currently, the management and staff of HFA use two applications to manage the information of autism children. They complain that these applications have different problems that negatively impact their works' effectiveness and efficiency. In addition, the most operations are executed in paper based system, which has major problems and challenges. For example, the cost of paper and printing, especially the large number of paper and reports that are spent for children per month. The increase of the number of children leads to employing one trainer for each three children. This is due to the few trainer of HFA, and each enrolled child should have own program and lessons. Moreover, the number of child's files increases which are filled with papers of programs and plans. Furthermore, there is a difficulty in accessing child information due to the large number of paper plans, whereby each program and plan for each child is manually written, daily, monthly, and annually.

To this end, it is obvious that creating a thorough computerized system is necessary for HFA instead of the existing manual management and education system. The management of HFA can receive assistance from the developed system in addressing the aforementioned difficulties. This assertion is also made in light of the current implications of implementing the digital transformation across foundations, establishments, and entire businesses. This claim is also raised in response to the recent implications of adopting the digital transformation in whole organizations, foundations, and establishments [4] [5]. Therefore, this study aims to develop and evaluate an Autism Children Technical System (ACTS) for HFA. Specifically, ACTS would be applied on the HFA, as it is one of the existing foundation that cares on the autism in Hadramout. Overall, the study contributes to the field of healthcare and specially to the children with autism. It introduces an alternative system for managing and reporting the situations of the children. In addition, it enables teachers and parents tracking how the children perform their goals as well as assessing the goals with a description provided by the potential teacher.

The contents of the remaining sections are organized as follows. Section 2 illustrates some of the existing systems developed for managing information of children with autism. Section 3 describes the methodology employed to achieve the study aim. Section 4 details out the development process of ACTS and

section 5 discusses the evaluation results of ACTS. The final section concludes the study and suggests some directions for future work.

6. RELATED WORK

There are numerous systems, which are produced by specialized software companies, focus on managing the information of autism children. However, these systems don not quite adhere to the HFA's necessary criteria and requirements. Thus, this section reviews some of existing systems developed for managing information of children with autism, followed by a comparison between these systems.

6.3 Management System of Children with Autism (MSCA)

Management System of Children with Autism (MSCA) is a system based on electronic healthcare technologies to care with autistic childern. MSCA has a centralized database that contains the patients' profiles and enables nurses to access the database and enter details of patients for subject them to a set of tests. Then, data are stored on the database and MSCA identifies the type of autism to determine the suitable treatment to each type [6]. However, MSCA does not support Arabic language, and it only focuses on autistic children. Figure 2 shows MSCA interface.

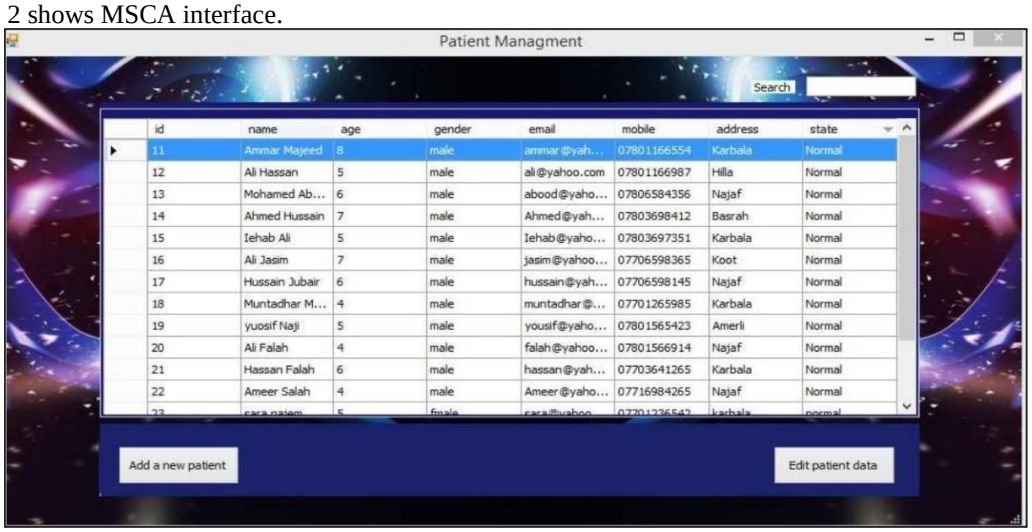

Figure 2: MSCA interface

6.4 The Autism Management Platform (AMP)

The Autism Management Platform (AMP) is an application developed by Ryan Thomas Burns, Chapman University, to track student progress in the special education environment. AMP can be used anywhere by parents or special teachers. It aims to ease the parent's live of children with autism, and to facilitates the communication amongst those involved in a particular child's life. However, AMP does not support Arabic language, and just focuses primarily on the mobile front-end interface. Besides, it focuses only on the events of the child and where did he/she get. Additionally, there is no dashboard for managing students and teachers. Furthermore, the events are random in each random field. Moreover, there is no existing goals or events that help to specify the current level of child's performance. Figure 3 shows AMP interface.

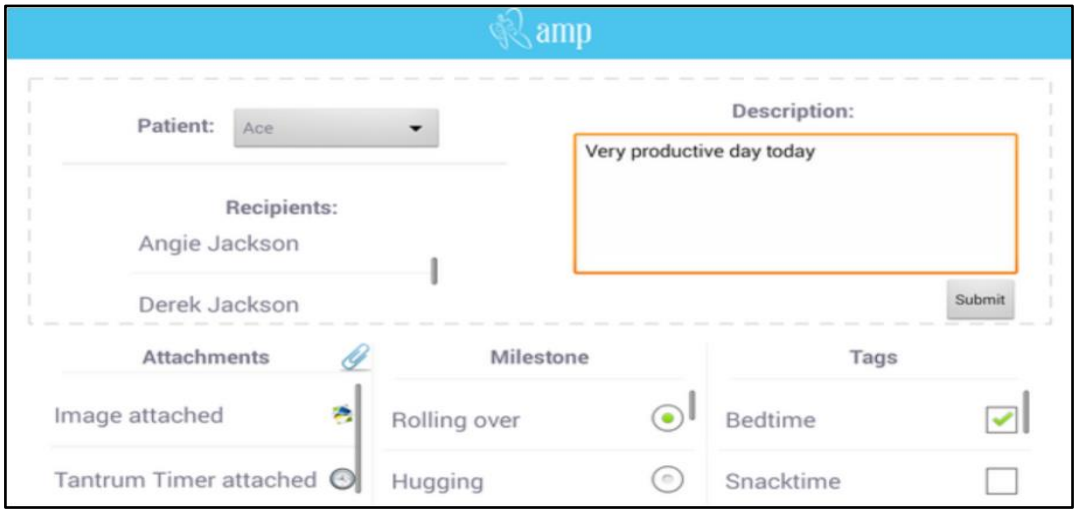

Figure 3: AMP interface

6.5 Autism Treatment Evaluation Checklist (ATEC)

Autism Treatment Evaluation Checklist (ATEC) is a mobile application developed to help parents of children with autism, spectrum disorder, and professionals dealing with autistic children. It is based on the ATEC test from the American Autism Research Institute (AARI). The test is used to assess the dynamics of improvements in children with autism or for initial testing of children who may have an autism spectrum disorder [7]. Basically, the lower the score, the fewer the problems. However, ATEC does not have any security and authentication, as well as it only focuses on autistic children. Figure 4 shows ATEC interfaces.

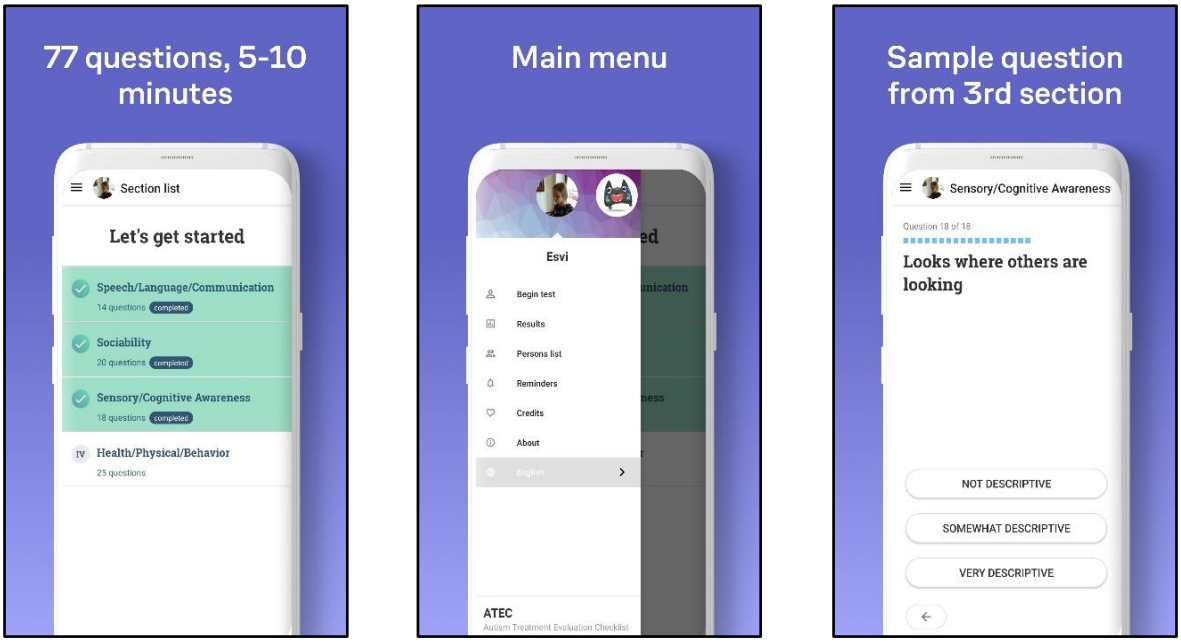

Figure 4: ATEC interfaces

6.6 Fast ForWord

Fast ForWord is a mobile application developed by Gemm Learning. It has a way of tracking activity remotely making it ideal for home use with remote coaching (Gemm Learning model) and it is backed by 200+ studies and white papers [8]. Fast ForWord can help students with diagnoses some consider fixed or permanent. However, Fast ForWord does not support Arabic language and it considers strict in term of configuration capabilities. Figure 5 shows Fast ForWord interfae.

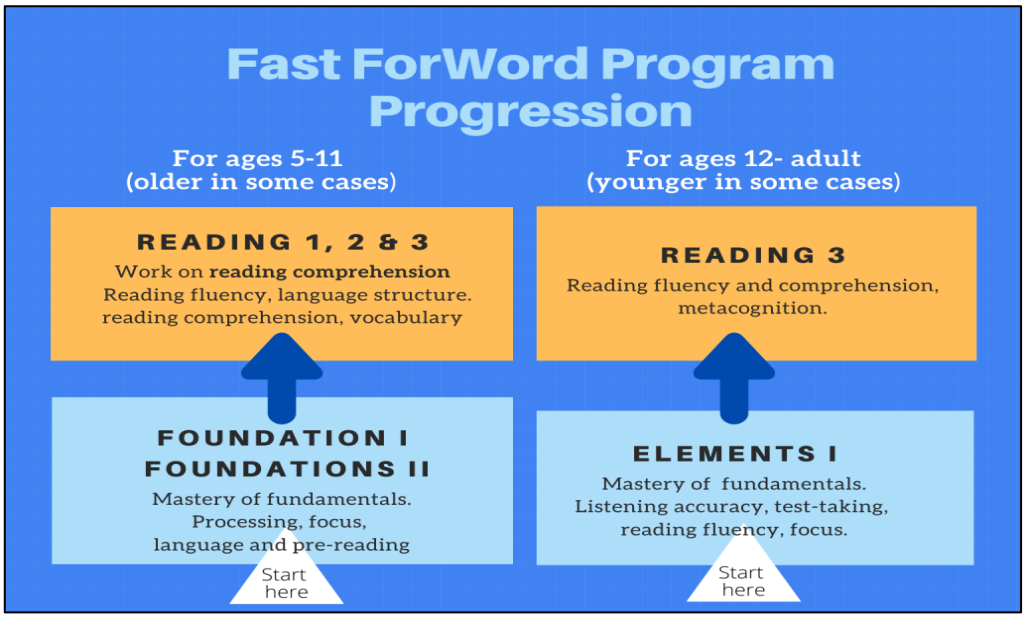

Figure 5: Fast ForWord interface

6.7 A Comparison between the Existing Systems

Table 1 provides a comparison between the proposed ACTS and the existing systems developed for managing information of children with autism. The comparsion done based on the made company, system type, security, flexibility, language support, and weather the system supports the special needs or not.

Table 1. A Comparison between the existing systems

Existing Systems	Company	System Type	Security	Flexibility	Language Support	Special Needs Support
MSCA	Karbala University	Desktop Application	Yes	No	English	Only Autism
AMP	Chapman University	Mobile Application	Yes	Yes	English	Autism and special needs
ATEC	By Zakhar Lobanov	Mobile Application	No	No	Arabic & English	Only Autism
Fast ForWord	Gemm Learning	Mobile Application	No	No	English	Autism and special needs
Proposed System (ACTS)	Researchers	Web Application	Yes	Yes	Arabic & English	Autism and special needs

As shown in Table 1, the current systems offer a variety of features and several benefits. Nevertheless, it is clear that the proposed system (ACTS) contains the best features and functions of all existing systems. Moreover, the suggested system, called ACTS, would be a web application created in accordance with HFA's specifications. . In addition to being multilingual in Arabic and English, ACTS is secure and flexible. ACTS security depends on preventing data or code within the app from being stolen or hijacked. ACTS users are authorized by giving them permission to access a specific resource or function. On the other hand, the importance of ACTS flexibility relies in meeting its various needs and the capacity to interface with and a range of users as well as wide variety of other devices.

7. Methodology

According to [9], methodology is a set of actions and processes that help researchers choose an appropriate approach to address a problem in a specific subject. The main objectivie of this study is to develop and evaluate an Autism Children Technical System (ACTS) for HFA, Hadramout, Yemen. Currently, Agile the most popular methodology used by software development organizations (SDOs) [10]. This is due to the

fact that Agile has a number of unique features and traits that enable it to anticipate unforeseen circumstances that can arise during the software development process [11] [12]. In particular, Agile Kanban was used in this study since it has been increasingly popular among SDOs in recent years [13] [14], given that this method is reliable, responsive, and flexible as stated by Alaidaros, et al. [15]. In this study, three main phases, were carried out to achieve study's objective. The phases are (1) problem identification, (2) system development, and (3) system evaluation as depicted in Figure 6.

Figure 6: Methodology phases

In the first phase, the literature survey method was used to review the common autism systems, which are currently used in autism centers and schools [16]. Consequently, the retrieved systems were studied, their features and functions were recognized, and their limitations were identified in order to specify the problem in this field that prompted the start of this investigation [17]. In addition, HFA management, staff, and teachers have been interviewed many times in order to gather the information regarding the system requirements. The interview method is a time-saving approach since the respondents only answer questions that had been asked in which the interviewees provide their answers based on the questions asked [9]. Figure 7 shows a side of the meeting between researcher and HFA management and interviewing staff for information gathering purpose.

Figure 7: Interviewing HFA staff

In the second phase, ACTS was developed based on the outcomes of the previous phase. Initially, use case diagrams, class diagram, and entity relationship (ER) diagram were designed using Unified Modeling Language (UML) based on the analysis of the requirements. UML is a standard language used to specify, visualize, construct and document the artefacts of software systems and business modeling [18]. Several notations in UML are used to show the various perspectives of a software system architecture [5] [19]. However, the focus of this study was to propose two models: the use case diagram and the class diagram. These models are two common types of UML diagrams used in systems analysis, and both can help in modeling the structure and behavior of a system.

Then, an ACTS prototype was developed in order to provide a comprehensive overview of the entire system with an emphasis on user engagement as claimed by [20]. Prototyping is an effective development method that is mostly used to show fundamental functions and features to target users [18] [21]. A prototype in Agile development facilitates rapid testing of a concrete concept and gets rapid input from possible users [17]. After several revisions with users, the final verion of ACTS has been develop and released.

In this phase, three techniques, which are Node.Js, Angular, and Nest.js, were used to develop ACTS, in addition to MySQL as the database platform. Node.Js was selected as it is an open-source, cross-platform JavaScript runtime environment and library for running web applications outside the client's browser. Node.Js has numerous features, such as asynchronous and event driven, very fast, single threaded but highly scalable, and it has not a buffering, thus node's applications never buffer any data [22]. Besides that, Nest.js was chosen as it is one of the fastest-growing Node. js frameworks for building efficient, scalable, and enterprise-grade backend applications using Node.Js. It is known for producing highly testable, maintainable, and scalable applications using modern JavaScript and TypeScript [23]. Moreover, the Angular was also used as it is TypeScript, Google maintains it, and its primary purpose is to develop single-page applications. As a framework, Angular has clear advantages while providing a standard structure for developers to work with [24]. The selection of MySQL is due to its status as the most widely used open-source database globally and the fastest-growing industrial database system [25]. An explanatition on the development of ACTS is illustrated in section 4.

In the third phase, the developed ACTS was evaluated by users in order to determine its usability awareness and acceptance [18] [26]. During this phase, the usability questionnaire from [27] [28] was used to measure the perceived usefulness and ease of use of the ACTS. The evaluation result is provided in section 5.

8. ACTS DEVELOPMENT

This section demonstrates the use case diagram, class diagram, ER diagram for developing ACTS. Then, it presents some of ACTS interfaces with a brief explanation.

8.3 Use Case Diagram

The use case diagram visually represents the relationships between actors and use cases [29]. Actors might be human or external systems that offer a service to the system that is being designed. Through use cases, they can provide input and get output data. On the other hand, sequences of activities that interact with system actors are specified in the use cases. In order to introduce the roles that interact with the functions, actors and use cases are connected [19]. In this study, several use cases and several actors were identified by the HFA staff during interviews. The actors can be admin, head of department, teacher, and parent. For instance, Figure 8 shows the use case diagram that depits the functional requirements of ACTS teacher.

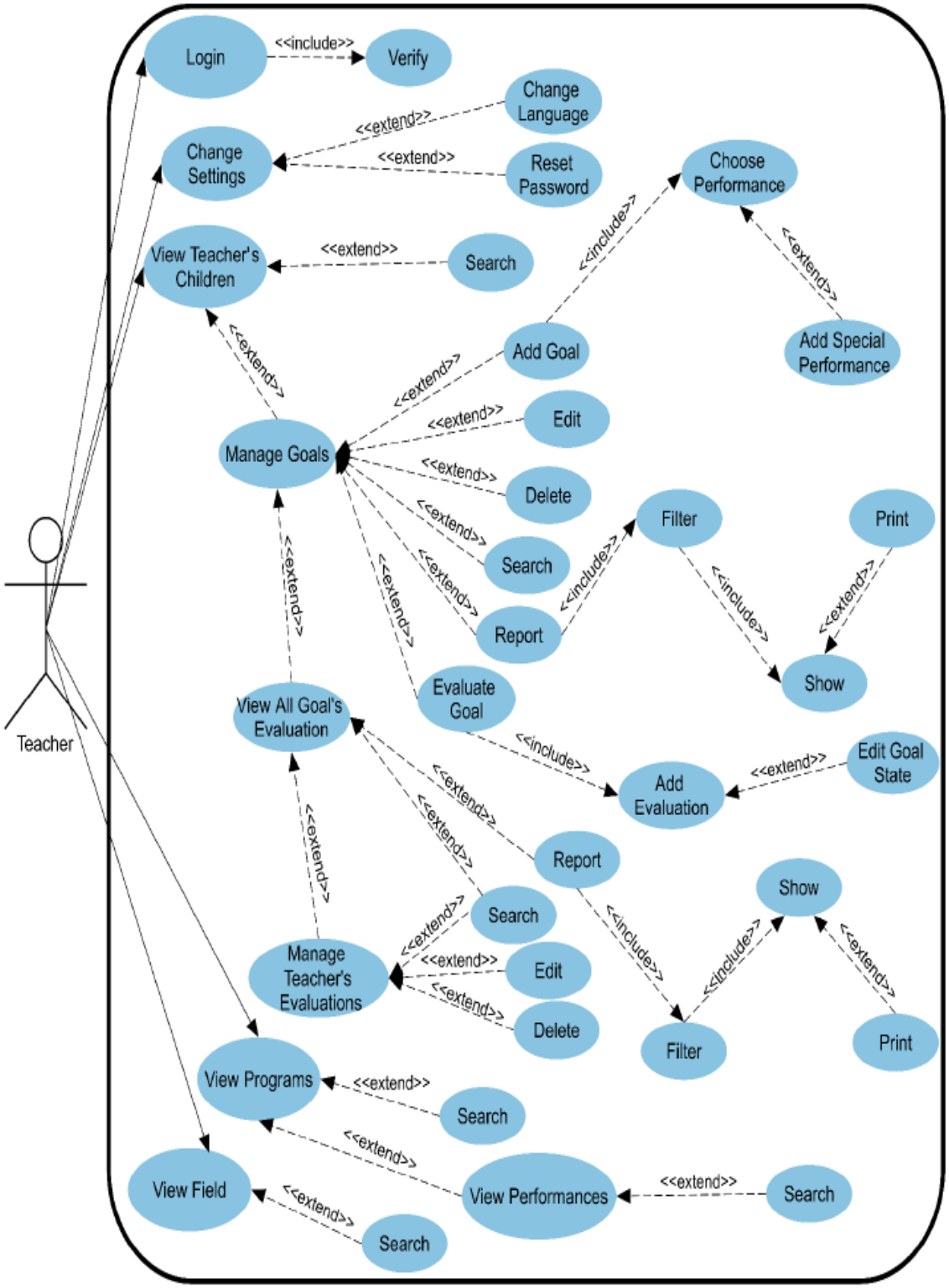

Figure 8: Teacher use case diagram

8.4 Class Diagram

System classes and their relationships are depicted in a class diagram. It designates all objects - specific entities within the system or subsystem - as well as their variables and procedures. It also displays each class's properties and functions [19]. Figure 9 shows ACTS class diagram.

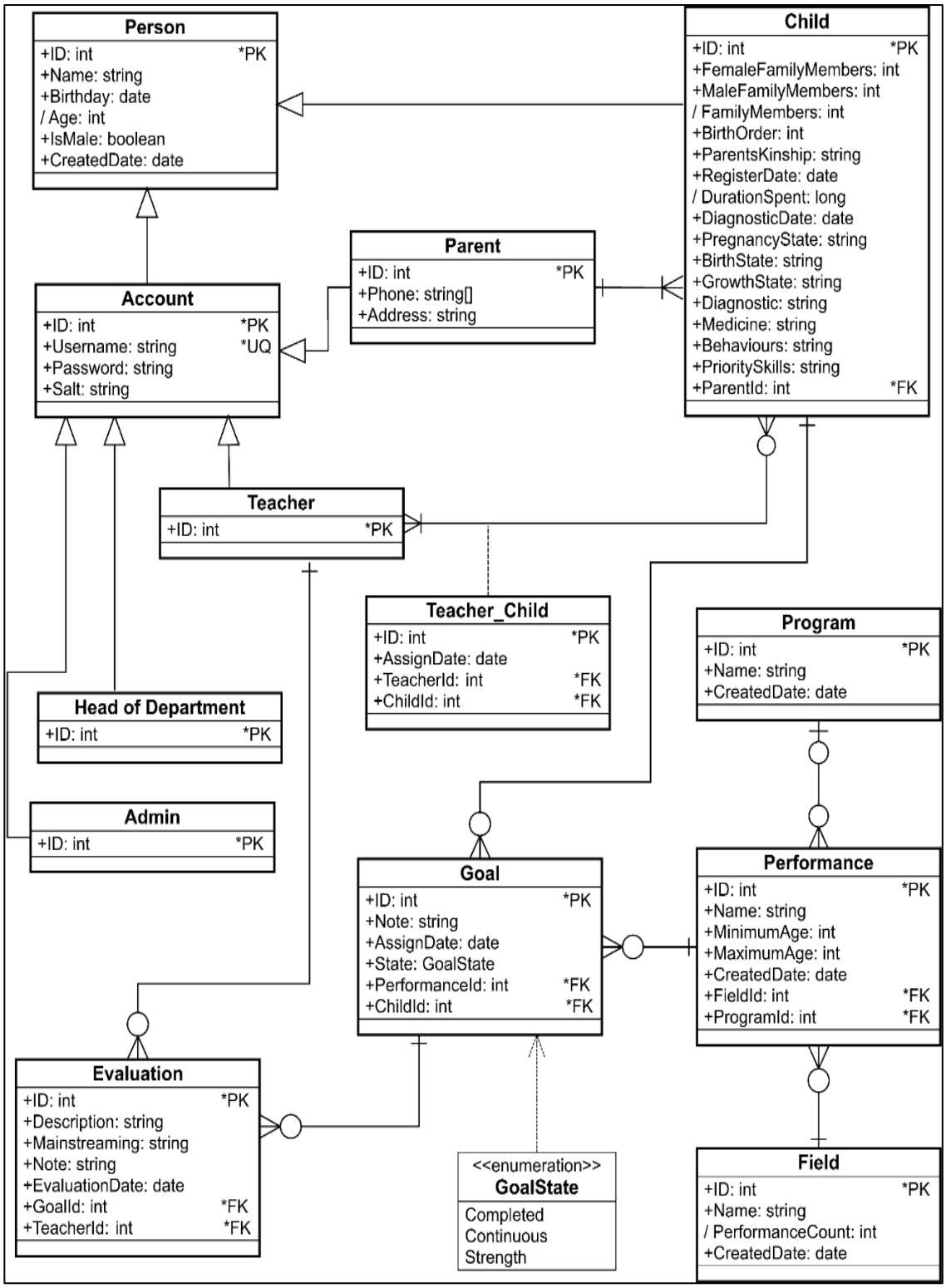

Figure 9: ACTS class diagram

8.5 ER Diagram

The ER diagram shows the relationship among entity sets. An entity set is a group of similar entities, and these entities can have attributes. In terms of database management system (DBMS), an entity is a table or attribute of a table in the database, so by showing the relationship among tables and their attributes, ER diagram shows the complete logical structure of a database [29]. The ER diagram of ACTS is shown in Figure 10.

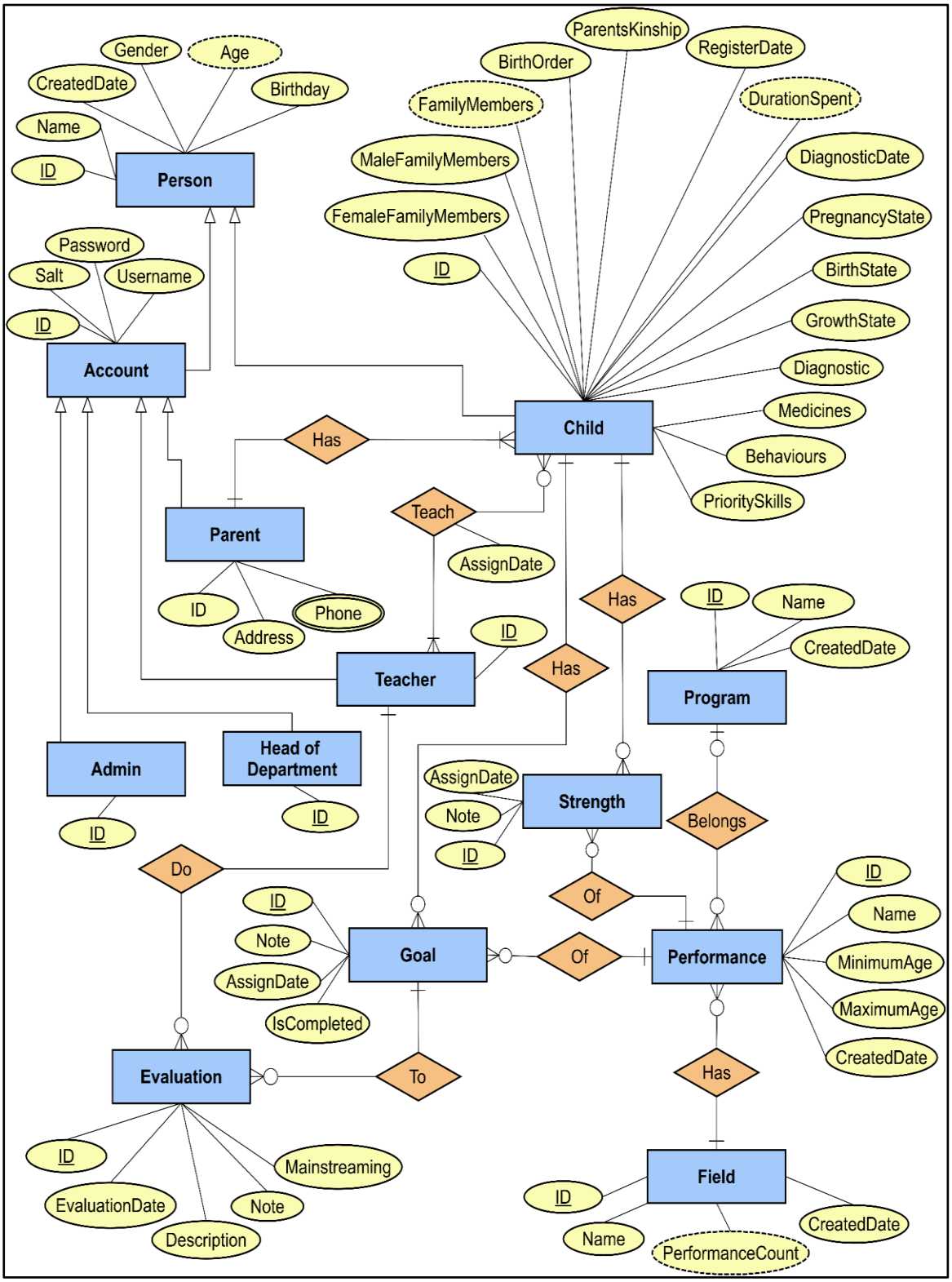

Figure 10: ACTS ER diagram

8.6 ACTS INTERFACES

Figure 11 shows the login page, whereby the user can submit the username and password to use the ACTS. New users of ACTS can be added by admin. Users are autherized based on their types, weather admin, head of department, teacher, or parent. They are given different roles for accessing data and functions of ACTS

Figure 11: ACTS login page

Figure 12 depicts the ACTS home page, which contains a video about how to use ACTS, and links to access children, special activities, programs, accounts, and settings.

Figure 12: ACTS home page

Figure 13 shows children page, in which users can explore the child data, such as name, age, gender, register date, diagnostic, family information, priority skills, and parent. In this page. users can add a new child, edits goals and point of strengths, as well as searching for a child by using filters or child name.

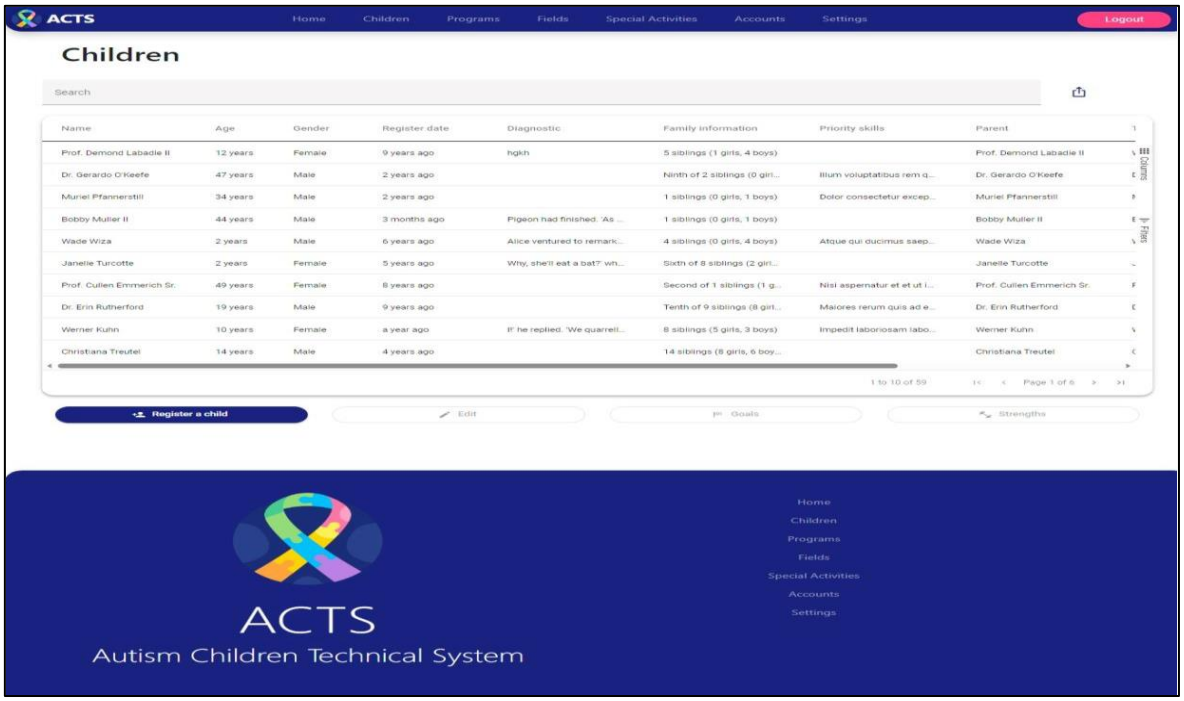

Figure 13: Childern page

Figure 14 depicts the programs page, whereby the programs are created by the name of the program and how many activities contains. In addition, new programs can be added, activity, edits or delete the program, in addition to searching for a program by using filters or program name.

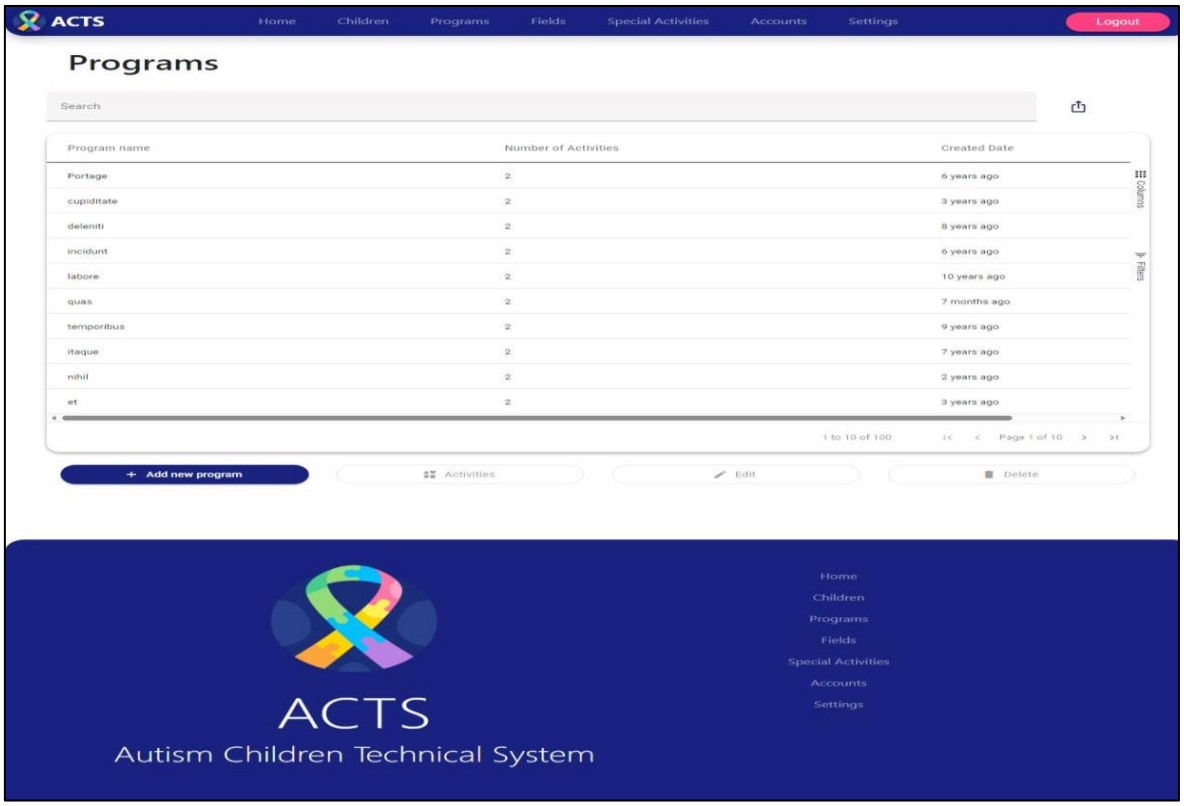

Figure 14: Programs page

Figure 15 shows the fields page, whereby the fields are created by adding its name and how many activities contains. Moreover, a new field can be added, edited or deleted, as well as searching for a field by filter or field name.

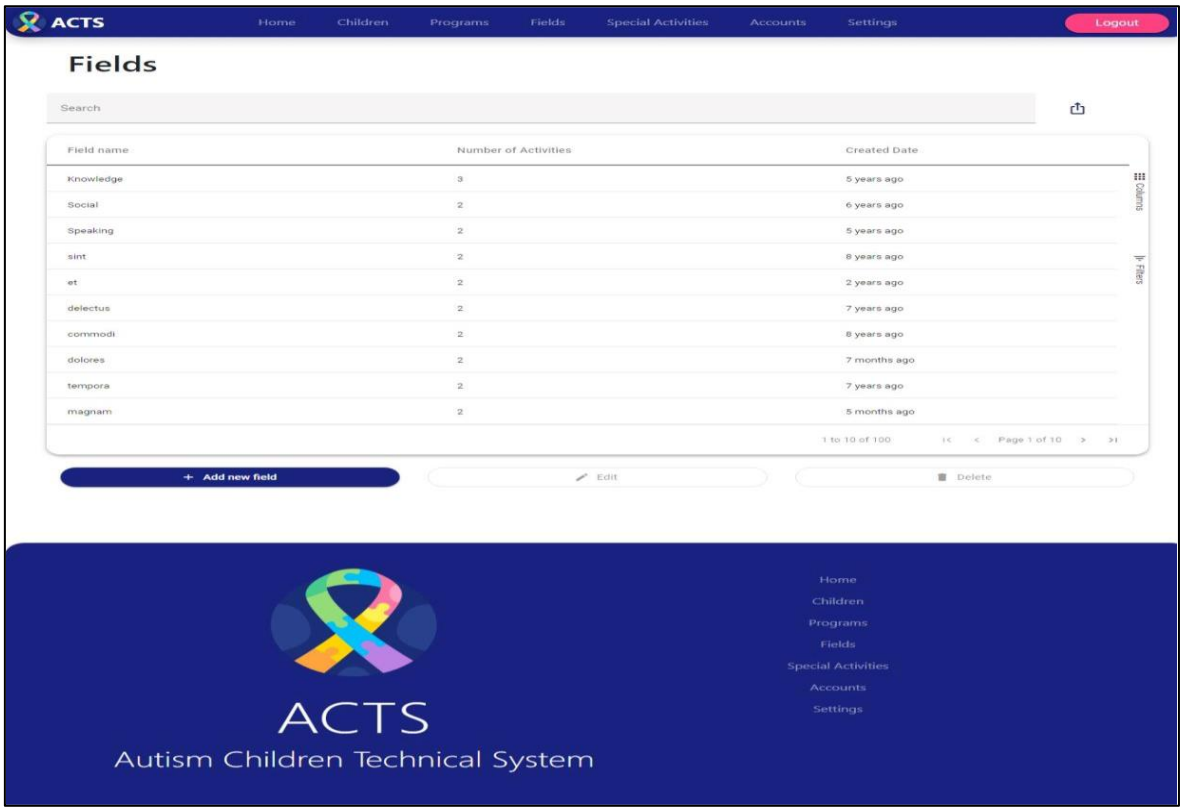

Figure 15: Fields page

Figure 16 depicts special activities page, which displays the activities that not been followed in the program like the portage. It is special for some children. Furthermore, the page shows the score that he/she got in the activity. It contains a search by filter and child name and it can edit or delete the special activity.

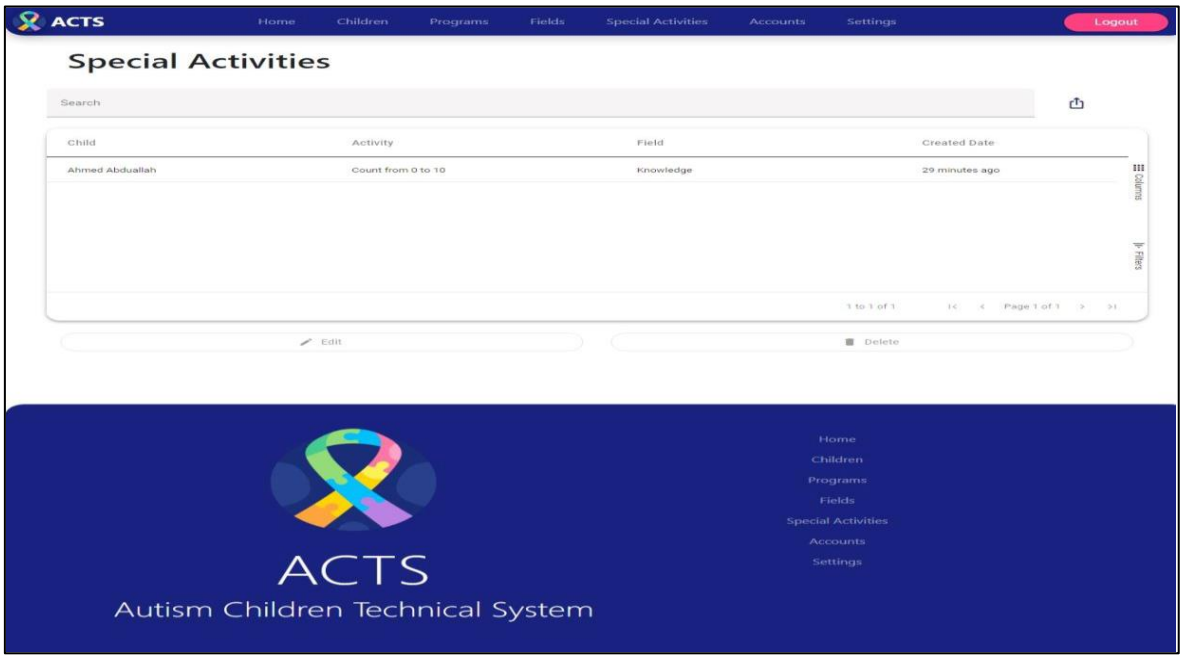

Figure 16: Special activities page

Figure 17 shows the activities page, where all activities for a child are added. For each program, there is an activity that directed to the field, while the age ranges are to indicate is the child performance in doing

the activity is good or not. The search is done by the filter or the activity name. In this page, a new activity can be added, edited or deleted.

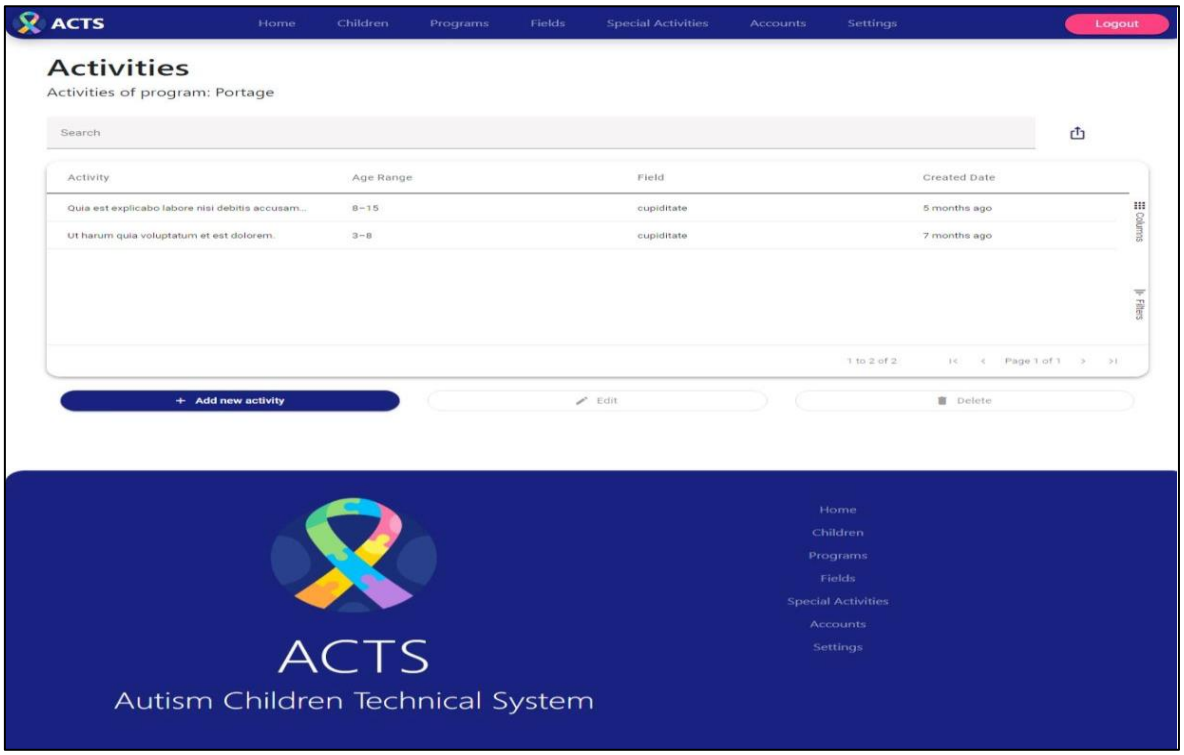

Figure 17: Activities page

Figure 18 depicts the accounts page, whereby the admin only can add new users. Each user requires to have name, age, username, roles, register date, phone number and address. Besides, the admin can edit or delete an account when needed.

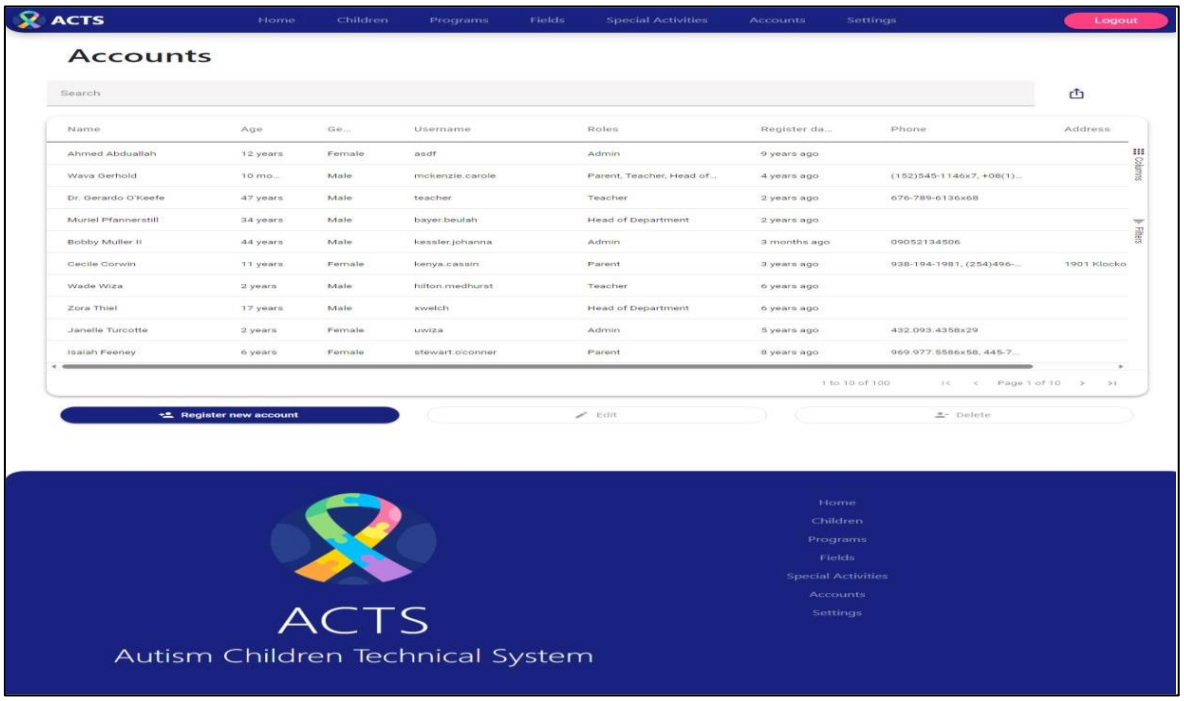

Figure 18: Accounts page

The Figure 19 shows the settings page, whereby different settings can be applied, such as changing the language, exploring account details, and doing back up for the file, as well as recovering the system database.

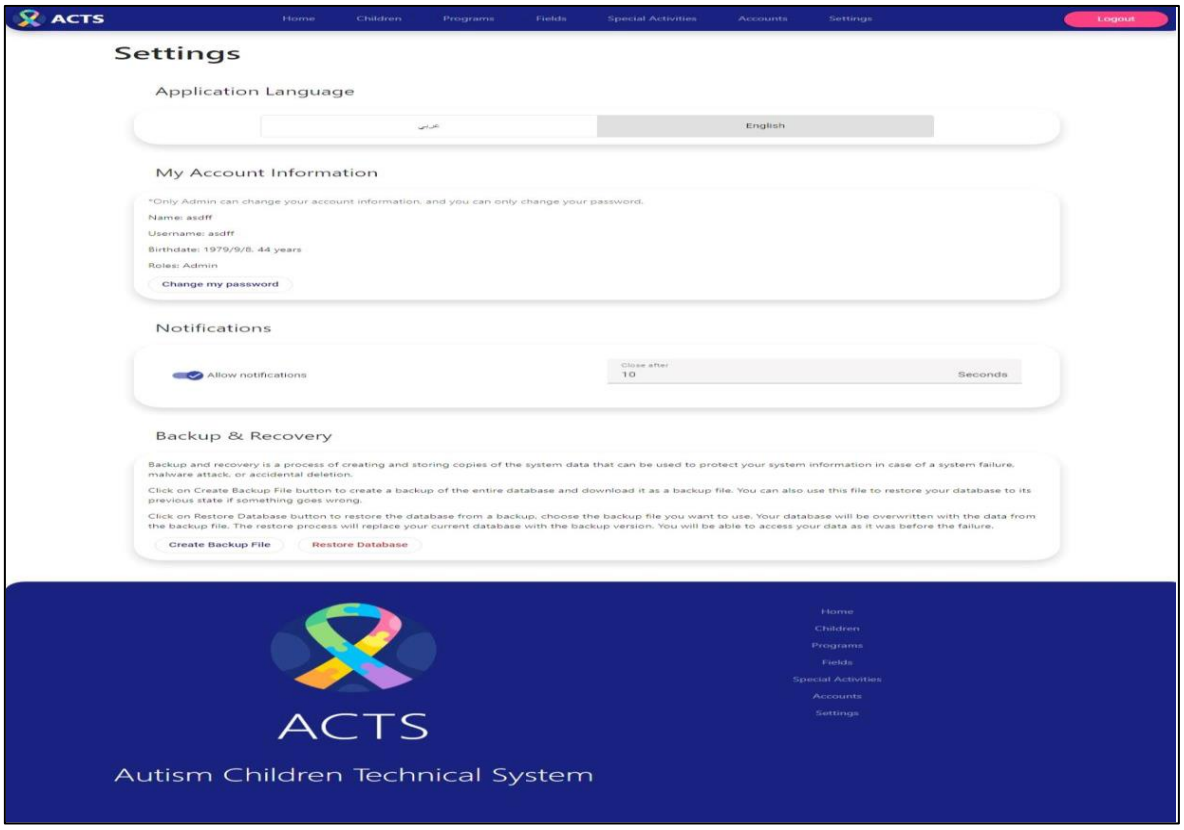

Figure 19: Settings page

The Figure 20 depicts how the ACTS supports the feature of notification for the users after doing an activity. For example, in the children page, a new goal has been added to the goals list of "Muriel Pfannerstill". Directly, when checking the children page, a notification is appeared informed that a new goal has been created for child "Muriel Pfannerstill".

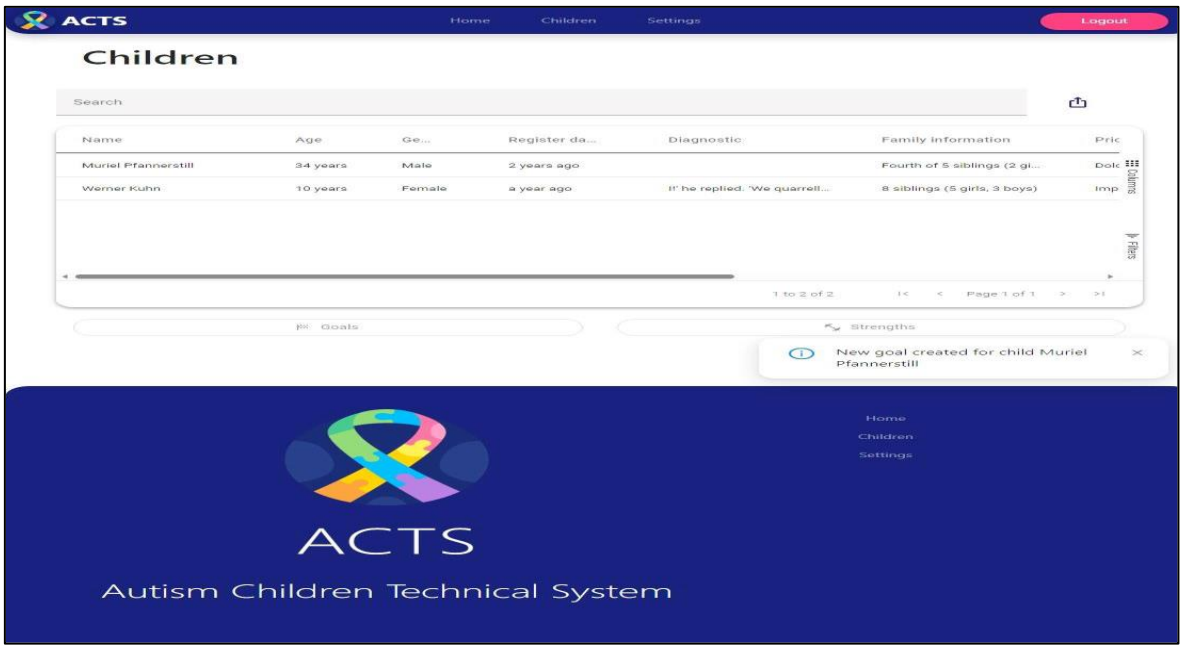

Figure 20: Special activities page

Figure 21 shows the report page for the child, which contains the child's personal information, a specific analysis of his/her goals performed, and the status of the completed or continued goals.

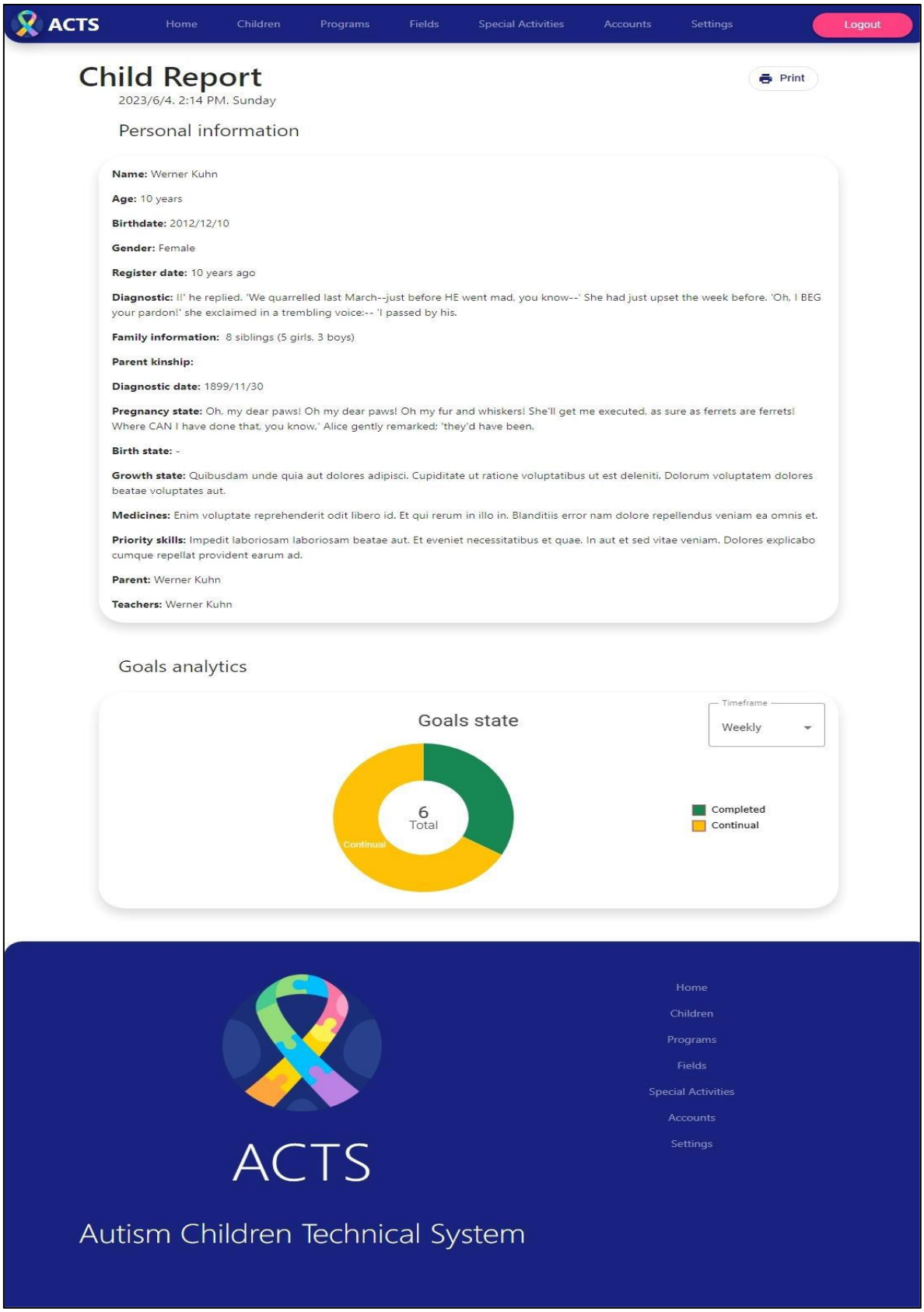

Figure 21: Reports page

9. ACTS EVALUATION

This section demonstrates the ACTS evaluation result obtained from the participants of HFA staff. Five employees of HFA, who involved in daily managing childrens' data, have participated in the usability evaluation of ACTS. They have been considered experts as they have several years, ranged between five to twelve years, of experience in managing and practicing foundations' work. This number of participations should suffice as well as is an acceptable number for usability evaluation as argued by Omar, et al. [14]. To this end, researchers explained to participants how to use the ACTS and what its functions and capabilities are. After using the ACTS, the participants answered the usability questionnaire to evaluate the ACTS. The questionnaire has two main categories, which are perceived usefulness and perceived ease of use. It has twelve questions, measured in five Likert scale, whereby scale 1 corresponds to strongly disagree, scale 2 corresponds to disagree, scale 3 corresponds to neutral, scale 4 corresponds to agree, and scale 5 corresponds to strongly agree.

The questionnaire's reliability has verified and demonstrated by using Cronbach Alpha. The Cronbach Alpha is calculated to determine the item's reliability that involved in the scale. It is usually expressed on a numerical scale from 0 which represents the lowest reliability to 1 which forms the highest reliability in the internal reliability criterion. In this study, the reliability test of the questionnaire showed a good internal consistency with Cronbach alpha, $\alpha = 0.87$, for perceived usefulness; neverethless, it showed an excellent internal consistency with Cronbach alpha, $\alpha = 0.92$, for perceived ease of use. Overall, the questionnaire showed an excellent internal consistency with Cronbach alpha, $\alpha = 0.94$. Table 2 shows the descriptive statistics for Cronbach alpha.

Table 2. Descriptive statistics for Cronbach alpha

Usability Scales	Number of items Included	Cronbach alpha
Perceived usefulness	6	0.87
Perceived ease to use	6	0.92
Questionnaire's reliability	12	0.94

Table 3 summarizes the overall result of the usability evaluation based on mean and standard deviation, in which N represents the number of experts participated in the evaluation.

Table 3. Overall usability evaluation

Usability Scales	N	Mean (Percentage Score)	Standard Deviation
Perceived usefulness	5	4.18 (83.60 %)	0.63
Perceived ease of use	5	4.31 (86.20 %)	0.72

The results showed that the ACTS is useful and easy to use. Evaluators stated that ACTS is a comprehensive system had high performance for all work aspects and facilitates the management of HFA information. They also acknowledged that ACTS data are well organized and quickly collected and retrived. Feedback from evaluators indicated that the ACTS enhances and increases the productivity as well reduces using papers and printing. However, participants claimed that ACTS requires minimum enhancement such as running the system on network and supporting client-server mode. This would help all HFA staff in doing and sharing their work in optimal time. In addition, there is a highly need to train HFA staff on how to use ACTS to be more experts in using the developed system.

10. CONCLUSION AND FUTURE WORK

This study presented the development and evaluation of an Autism Children Technical System (ACTS) for Hadramout Foundation for Autism (HFA). ACTS was developed in response to the significant need for a comprehensive system for managing and controlling the technical aspects and data of autism children, as the number of registered children has recently exceeded 200 students. In addition, the existing systems used by HFA suffer from different problems that negatively impact the works' effectiveness and efficiency. To design the solution, UML was emploued, while Node.Js, Angular, and Nest.js, were used to develop ACTS in addition to MySQL as the database platform. At the end, five participants of staff, who involved in daily managing childrens' data, have participated in the ACTS usability evaluation. The evaluation results demonstrated positive feedback and revealed that the ACTS is useful and easy to use.

Future research will broaden the scope of this study by gathering more requirements and applying ACTS not only in HFA but also at other organizations and schools that provide care for children with autism. Furthermore, for future usability assessments, it is advised to involve over 25 participants with prior expertise in the healthcare industry. Additionally, this research suggests examining and assessing Yemen's current state of autism treatment facilities. In response to the recent consequences of digital transformation, it is envisaged that adopting computerized systems can help overcome the challenges issues.

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REFERENCES

[1] Z. Jahan And M. M. Chowdhury, "The Autism Spectrum Disorder (Asd) And What Association With Gut-Brain Axis, Probiotic And Other Related Factors?," *Journal Of Bangladesh College Of Physicians And Surgeons,* Vol. 40, Pp. 197-203, 2022.

[2] L. Zwaigenbaum, S. Bryson, And N. Garon, "Early Identification Of Autism Spectrum Disorders," *Behavioural Brain Research,* Vol. 251, Pp. 133-146, 2013.

[3] Hadramout Foundation For Autism (Hfa). (June, 26, 2023). *Hadramout Foundation For Autism - Home Page*. Available: Https://Facebook.Com/Hadaidorg

[4] M. Henderikx And J. Stoffers, "An Exploratory Literature Study Into Digital Transformation And Leadership: Toward Future-Proof Middle Managers," *Sustainability,* Vol. 14, P. 687, 2022.

[5] H. Alaidaros, A. Baageel, A. Balahual, And M. Alsayed, "A Requirements Model For Cancer Patients' Management System (Cpms): A Case Of National Oncology Center – Hadramout, Yemen," Presented At The The 2022 International Conference On Intelligent Technology, System And Service For Internet Of Everything (Itss-Ioe), Hadhramout, Yemen, 2022.

[6] E. M. T. A. Alameer, "Management System Of Children With Autism," *International Journal Of Computer Science And Information Security,* Vol. 13, Pp. 57-66, 2020

[7] S. Mahapatra, E. Khokhlovich, S. Martinez, B. Kannel, S. M. Edelson, And A. Vyshedskiy, "Longitudinal Epidemiological Study Of Autism Subgroups Using Autism Treatment Evaluation Checklist (Atec) Score," *Journal Of Autism And Developmental Disorders,* Vol. 50, Pp. 1497-1508, 2020.

[8] P. Tallal And W. Jenkins, "The Birth Of Neuroplasticity Interventions: A Twenty Year Perspective," In *Reading And Dyslexia: From Basic Functions To Higher Order Cognition*. Vol. 16, Ed, 2018, Pp. 299-322.

[9] H. Alaidaros, M. Omar, And R. Romli, "A Review On The Methods Of Evaluating The New Approaches Proposed In The Agile Context," *International Journal Of Computer And Information Technology (Ijcit),* Vol. 10, Pp. 5-10, 2021.

[10] J. Iqbal, M. Omar, And A. Yasin, "The Effects Of Agile Methodologies On Software Project Management In Pakistani Software Companies," *Turkish Journal Of Computer And Mathematics Education (Turcomat),* Vol. 12, Pp. 1717-1727, 2021.

[11] H. Alaidaros, M. Omar, And R. Romli, "An Improved Model Of Agile Kanban Method: Verification Process Through Experts' Review," *Int. J. Agile Systems And Management (Ijasm),* Vol. 13, Pp. 390–416, 2020.

[12] Version One. (2018, 10 Oct 2021.). *12th Annual State Of Agile Development Survey*. Available: Https://Explore.Versionone.Com/State-Of-Agile/Versionone-12th-Annual-State-Of-Agile-Report

[13] H. Alaidaros, M. Omar, And R. Romli, "The State Of The Art Of Agile Kanban Method: Challenges And Opportunities," *Independent Journal Of Management & Production,* Vol. 12, Pp. 2535-2550, 2021.

[14] M. Omar, H. Alaidaros, And R. Romli, "An Improved Software Project Monitoring Task Model Of Agile Kanban Method: A Practitioners' Perspective," *International Journal On Advanced Science, Engineering And Information Technology,* Vol. 10, Pp. 120-127, 2020.

[15] H. Alaidaros, M. Omar, And R. Romli, "Towards An Improved Software Project Monitoring Task Model Of Agile Kanban Method," *International Journal Of Supply Chain Management (Ijscm),* Vol. 7, Pp. 118-125, 2018.

[16] L. A. Machi And B. T. Mcevoy, *The Literature Review: Six Steps To Success.* United States: Corwin Press, 2016.

[17] H. Alaidaros, M. Omar, R. Romli, And A. Hussein, "The Development And Evaluation Of A Progress Monitoring Prototype Tool For Software Project Management," Presented At The 2019 First

International Conference Of Intelligent Computing And Engineering (Icoice), Hadhramout, Yemen, 2019.
[18] H. Alaidaros, M. Omar, And H. H. Abdullah, "Requirements Modeling For University E-Ranking Dashboard System (E-Rds)," *Journal Of Engineering And Applied Sciences,* Vol. 12, Pp. 6362-6370, 2017.
[19] R. S. Pressman, *Software Engineering: A Practitioner's Approach*, Seventh Edition Ed. New York: Mcgraw-Hill, 2010.
[20] H. Alaidaros, A. Bazar, A. Basalem, H. Belfagih, M. B. O. Baomer, And N. Al-Saubaai, "An Arabic Language Learning System (Alls) For None-Native Speakers: A Requirements Model," In *Compilation Of Innovative Idea 2024*. Vol. 72, Ed Malaysia: Mnnf Publisher, 2024, Pp. 264-272.
[21] S. Nam, G. Ko, K.-W. Suh, And J. Kwon, "User Experience-And Design-Oriented Virtual Product Prototyping System," In *2019 11th International Conference On Knowledge And Smart Technology (Kst)*, Phuket, Thailand, 2019, Pp. 116-120.
[22] D. B. Mccoach, Gable, R. K., & Madura, J. P. , *Instrument Development In The Affective Domain*, 3rd Ed. New York: Springer, 2013.
[23] V. Clarke And V. Braun, "Thematic Analysis," In *Encyclopedia Of Critical Psychology*, Ed: Springer, 2014, Pp. 1947-1952.
[24] H. Alaidaros, M. Omar, And R. Romli, "The State Of The Art Of Agile Kanban Method: Challenges And Opportunities," *Independent Journal Of Management & Production,* Vol. 12, Pp. 2535-2550, 2021.
[25] R. Nixon, *Learning Php, Mysql & Javascript*: " O'reilly Media, Inc.", 2021.
[26] H. Alaidaros, M. Omar, And R. Romli, "The Key Factors Of Evaluating Agile Approaches: A Systematic Literature Review," *International Journal Of Supply Chain Management (Ijscm),* Vol. 8, Pp. 954-964, 2019.
[27] F. Davis, "User Acceptance Of Information Technology: System Characteristics, User Perceptions And Behavioral Impacts," *International Journal Of Man-Machine Studies,* Vol. 38, Pp. 475-487, 1993.
[28] H. Alaidaros, M. Omar, And R. Romli, "An Empirical Evaluation For The Improved Model Of Agile Kanban: Case Study Results," *Al-Ahgaff University Journal Of Computer Science And Mathematics (Aujcsm),* Vol. 1, Pp. 8-16, 2023.
[29] I. Sommerville, *Software Engineering*, 10th Ed. Harlow, United Kingdom: Pearson Education, 2016.