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Developing and Implementing an Online Learning Platform for Children with Autism

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ABSTRACT

Approximately 50% of all individuals with Autism have difficulties in developing functional language owing to communication deterioration. An online learning platform that provides educational games help these individuals feel more comfortable and relaxed doing such activities. Although numerous platforms are available for individuals with Autism, they are difficult to use; particularly in terms of user-interface design. In this paper, we present the design and develop online learning platforms, designed as a tool to encourage social interaction in autistic children. The proposed system was analyzed, design and developed using the Unified Modeling Language (UML) and ASP.NET.

Keywords : Autism, Learning Platform, Social Skills, Unified Modeling Language.

I. INTRODUCTION

Autism is a neural syndrome that complicates the growth of mind, producing a challenging result in communicating, social interaction, and impairment in behavior. Since there is no cure for autism, prompt interventions and effective educational exercises allow children to achieve massive improvement. During the teaching and learning process, children with autism require particular consideration and attention. Thus, with the implementation of information technology in special education, the teaching and learning process could become more efficient. Struggle in social interaction skills is known as one of the main drawbacks encountered by children with autism [1].

Autism is indicated by three symptoms: (1) communication in terms of verbal and non-verbal language; (2) social interaction in terms of challenges in recognizing and understanding other people's emotions and expressing their own emotions; and (3) patterns of restricted or repetitive behaviors that are related to adapting to new environments [1, 2]. Individuals with Autism Spectrum Disorders exhibit delayed development of speech and language [3]. A child with these symptoms will exhibit difficulties in learning and participating in an educational atmosphere unless the condition is addressed early [3]. In this paper, we present the design and develop online learning platforms, designed as a tool to encourage social interaction in autistic children.

II. RELATED WORKS

Babnoor, the first Arabic language app of its kind, launches in the UAE, aiming to help children with autism and other developmental disabilities [4]. Babnoor is considered one of the innovative technical solutions in the form of a smartphone application

that teaches children how to form sentences using symbols and images through enhanced and alternative means of communication "ACC". This includes the option of converting readable texts into audible speech as well as providing easy-to-use vocabulary [4]. Figure 1 shows the homepage for Babnoor application.

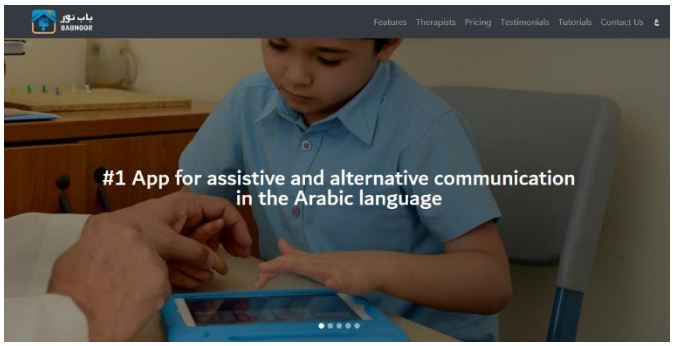

Figure 1: The homepage for Babnoor application.

Saudi autism it aims to develop and intensify comprehensive services needed by the autistic people and their families, in coordination with governmental, charitable and private organizations in order to create an information base on all types of autism and the centers that provide them with care and rehabilitation in the Kingdom [5]. Saudi autism working on establishing a specialized care center for autistic people in many regions of the Kingdom based on studies and research data. Figure 2 shows the homepage for a Saudi autism website.

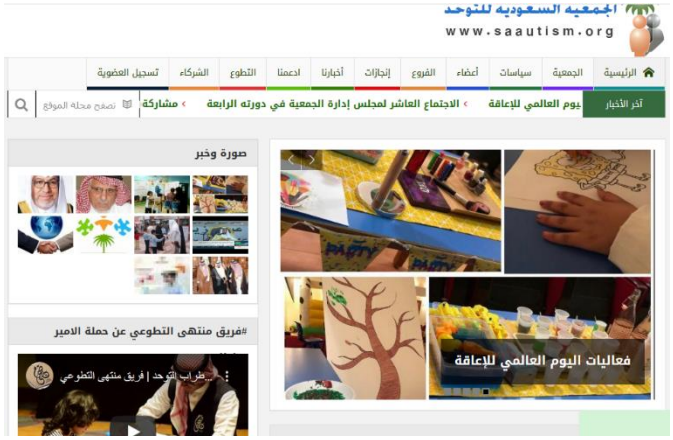

Figure 2: The homepage for a Saudi autism website.

Tafaol center is a non-profit site that provides educational services for people with special needs to educate and qualify them to rely on themselves and integrate them into society. It also provides individual and group rehabilitation services for all ages such as medical and social services, family counseling services, psychological rehabilitation service and behavior modification, programs and include specialized educational programs, Motor skills development programs, self-reliance programs, daily life skills training programs, social entertainment programs, early intervention programs. Figure 3 illustrates the main interface for Tafaol center site.

Figure 3: The main interface for Tafaol center site.

Kalameeonline is the first Arabic site to provide counseling services, develop training plans for autistic children, and teach parents of autistic children how to train their children themselves online [6]. Figure 4 shows the homepage for Kalameeonline site.

Figure 4: The homepage for Kalameeonline site.

The technological revolution influenced everything [7-84], even the methods of helping people with autism to improve their social skills. Today, the use of Artificial Intelligence (AI) algorithms is expansive, particularly in providing solution to challenging problems including patterns recognition and retrieval

of information [40, 73], image segmentation [10, 28, 29, 44, 85-89], analysis of medical image [30, 34, 90-92], Learning Management System [20], nurse rostering problem [93], Healthcare Monitoring system [47, 58], as well as prediction of river flow [39, 94, 95]. Accordingly, many researchers have used artificial intelligence as an effective tool for helping people with autism to improve their social skills [96-98].

III. METHODOLOGY

The process of system analysis aims to study an existing system to entirely design a new system. System analysis is performed to achieve mainly two aims namely:

1. To understand the process or the system clearly. This will assist in the new system design.
2. System analysis will help to identify the problems in the existing system; therefore this will help to know the inefficiency reasons.

The Unified Modeling Language (UML) is a visualization for the system design, it represents graphical notations that help to describe and design software systems, principally software systems constructed utilizing the object-oriented style [99-103]. The UML was utilized mainly to design the proposed system. The Use-Case diagram and the context diagram are addressed below.

- **Use Case Diagram**

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses. In this case, the actors are the System Administrator, User and Consultant. Figure 5 shows the use case diagram for the proposed system.

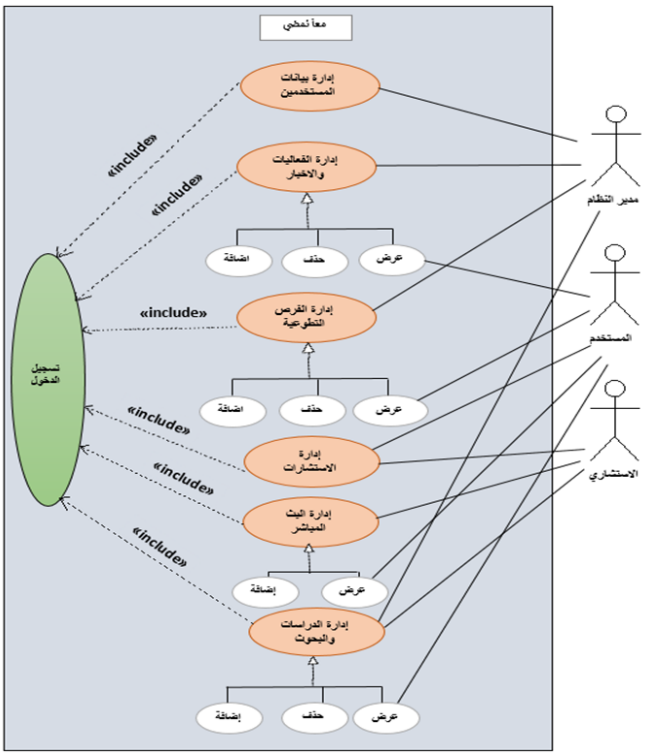

Figure 5: Use Case Diagram of the proposed system

- **Context Diagram**

A system context diagram (SCD) in engineering is a diagram that defines the boundary between the system or part of a system, and its environment, showing the entities that interact with it [104]. This diagram is a high-level view of a system. It is similar to a block diagram. Figure 6 shows the Context diagram for the proposed system.

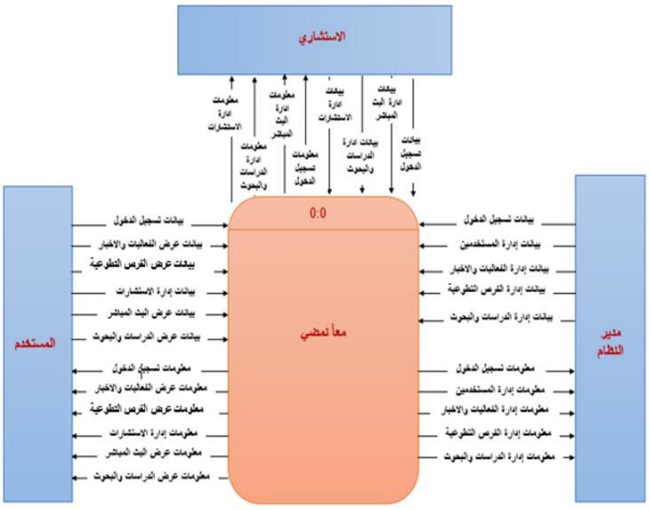

Figure 6: The Context Diagram for the proposed system.

- **Entity-Relationship (ER) Diagram**

An Entity Relationship diagram (or ER diagram) describes interrelated things of interest in a specific domain of knowledge. A basic ER model is composed of entity types (which classify the things of interest) and specifies relationships that can exist between entities (instances of those entity types) [45, 46, 55, 56, 105]. In addition, ER diagrams are commonly employed along with data flow diagrams (DFDs), which delineate the information flow for systems or processes [45, 46, 55, 56, 105]. Figure 7 shows the ER diagram for the proposed system.

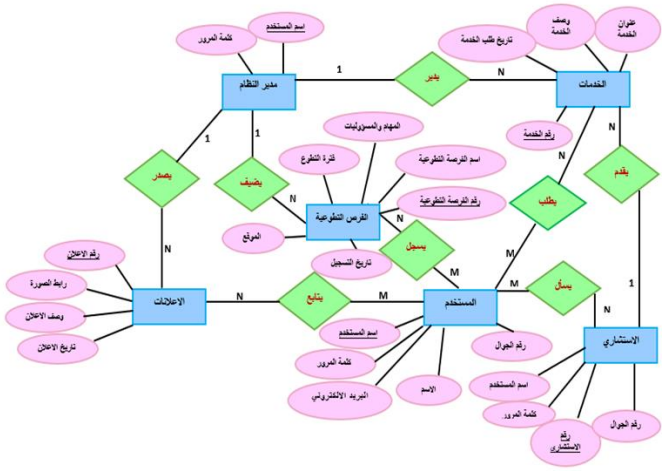

Figure 7: ER diagram for the proposed system.

1. Interface Design

In the proposed system, the user starts with the registration in the system; after that, the system offers the user a form for login and the user has to enter the information required as shown in figure 8. If the information is found correct by the system search in the database, it displays to the user the system homepage and allows the user to make use of the proposed system. However, if it's not valid, the user will be redirected to the login page. The programming language utilized in this work is ASP.NET. The programming language was chosen based on the features of the language which makes them more suitable for this work. Figure 8 and 9 shows the registration and login interface respectively.

Figure 8: Registration interface

Figure 9: login interface

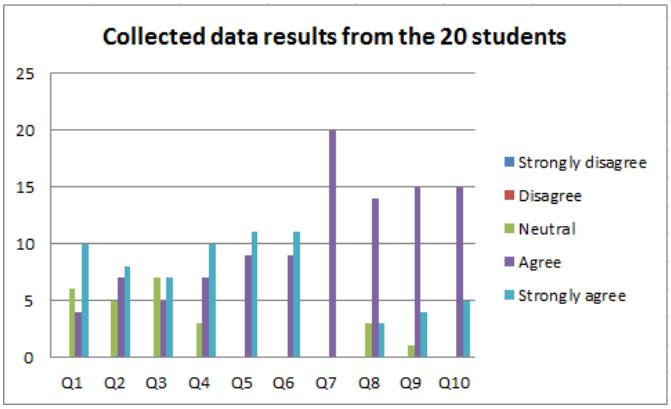

Figure 10: collected data results from the 20 students.

IV. DISCUSSION

This stage highlights the usability of the proposed system. During this stage, the system is evaluated while user satisfaction is ensured. The test was executed on the proposed system by running it on Mozilla Firefox and Internet Explorer using the localhost server. For evaluation purposes, 20 students from the College of Applied Studies and Community Service at Imam Abdurrahman Bin Faisal University (IAU) were invited to use the prototype. The students were first briefed on the prototype's usage and the user interface. Then, the students tested the system and answered the survey questionnaire consisting of 10 items formulated to gauge the level of user satisfaction. The usability of the proposed system was also determined. The result, as well as the level of usability of the system according to the feedback provided by 20 students, can be referred to in figure 10. As can be construed by the result, a significant amount of users agrees that the system is practical, useful and fulfill the project's primary objective.

V. CONCLUSION

An online learning platform that provides educational games help these individuals feel more comfortable and relaxed doing such activities. Although numerous platforms are available for individuals with Autism, they are difficult to use; particularly in terms of user-interface design. In this paper, we present the design and develop online learning platforms, designed as a tool to encourage social interaction in autistic children. The proposed system was developed using the Unified Modeling Language (UML) and ASP.NET.

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