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Review Article

Creating a Platform for Individuals With Down Syndrome and Their Families Using Structural System Analysis and Design Methodology: a Review for Theoretical Framework

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Abstract

Although the abundance of attempt available for people with special needs, organized approaches and research regarding Down syndrome are obviously lacking. This study aims to address the lack of platforms that systematically provide services that meet the needs of people with Down syndrome and their families by designing a multi-functional, comprehensive, and systematic digital platform using the Structural System Analysis and Design Methodology (SSADM), which is widely used within the field of systems engineering. For managing the project's complexity and offering an efficient system design, SSADM was chosen. In addition to drawing attention to the gap that currently exists, the study intends to create a website where people with Down syndrome can communicate with one another, exchange experiences, stay up to date on current events, get professional advice and legal information, and access educational and recreational materials that have been specifically created for them. The goal is to remove the present complexity, guarantee that the data that may be gained for the development of these persons is gathered together. Our main goal in this study is to bring together multiple services under a single platform for people with Down syndrome and their families. In this context, various studies conducted in the literature have been compiled and attempted to be presented in a review style to establish a theoretical framework.

Keywords: Down syndrome, Systems engineering, SSADM, Digital platform, Website

Yapısal Sistem Analizi ve Tasarım Metodolojisi Kullanarak Down Sendromlu Bireyler ve Aileleri için Bir Platform Oluşturma: Teorik Çerçeve Üzerine Bir İnceleme

Özet

Özel ihtiyaçları olan bireyler için birçok girişim bulunsa da, Down sendromu konusundaki yaklaşımlar ve araştırmalar yetersiz kalmaktadır. Bu çalışma, Down sendromlu bireylerin ve ailelerinin ihtiyaçlarını karşılayan hizmetleri sistemli bir şekilde sunan platform eksikliğini ele almayı amaçlamaktadır. Bu amaçla, sistem mühendisliği alanında yaygın olarak kullanılan Yapısal Sistem Analizi ve Tasarım Metodolojisi (SSADM) kullanılarak çok fonksiyonlu, kapsamlı ve sistemli bir dijital platform tasarlama hedeflenmektedir. Projedeki karmaşıklığı yönetmek ve etkili bir sistem tasarımı sunmak amacıyla SSADM tercih edilmiştir. Mevcut boşluğa dikkat çekmenin yanı sıra, çalışma, Down sendromlu bireylerin birbirleriyle iletişim kurabileceği, deneyimlerini paylaşabileceği, güncel olayları takip edebileceği, profesyonel tavsiye ve hukuki bilgilere ulaşabileceği, onlar için özel olarak oluşturulmuş eğitim ve eğlence materyallerine erişebileceği bir web sitesi oluşturmayı amaçlamaktadır. Bu platformun geliştirilmesi için elde edilebilecek verilerin bir araya getirilmesini sağlamak, mevcut karmaşıklığı ortadan kaldırmak ve Down sendromlu bireyler için birden çok hizmeti tek bir platformda bir araya getirmek ana hedeflerimiz arasındadır. Bu kapsamda literatürde yapılan çeşitli çalışmalar derleme tarzında ele alınıp teorik çerçeve ortaya konmaya çalışılmıştır.

Anahtar Kelimeler: Down Sendromu, Sistem Mühendisliği, SSADM, Dijital Platform, Website

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1. INTRODUCTION

Humans typically have 23 pairs of chromosomes, with one set inherited from each parent. Down syndrome arises due to improper cell division, resulting in an extra copy of chromosome 21, giving individuals 47 chromosomes instead of 46. This genetic disorder is linked to maternal age, with women over 35 at higher risk. For births occurring at the age of 20, this rate is 1 in 1441 births; at the age of 30, it becomes 1 in 959 births; and at the age of 40, it rises to 1 in 84 births. However, most cases (75–80%) occur in younger mothers, as they have higher pregnancy rates. Globally, around 6 million people have Down syndrome, with an estimated 70,000 cases in Türkiye.

Down syndrome manifests in three forms: Trisomy 21 (90–95% of cases), caused by improper chromosome separation during fertilization; Translocation (3–5%), where part of chromosome 21 attaches to another chromosome; and Mosaicism (2–5%), due to errors occurring later in cell division. While Trisomy 21 and Mosaicism are typically non-hereditary, Translocation may be inherited if a parent is a carrier. Maternal carriers have a 20% risk of passing it on, whereas male carriers have a 2–5% risk. These variations explain the genetic mechanisms behind the disorder.

Children with Down syndrome have unique personalities, skills, and intellect levels, just like any other child. The capacity of these persons to use their capacities at the fullest level depends on their obtaining the proper help at the appropriate moment. In order to do this, families' approach to this matter is crucial. Families should be aware of the choices available to them, including play groups, early education programs, physiotherapy, language therapy, alternative therapies, and other services, and they should take the appropriate action to address these concerns for their children's development. Families should consider these possibilities to the greatest extent possible and seek information from the appropriate sources. Nevertheless, many people with specific needs have limited access to dispersed and insufficient services.

It was once believed that individuals with Down syndrome were unable to read due to societal ignorance. However, today, many individuals with Down syndrome complete high school, obtain university degrees, learn additional languages, find employment, and lead semi-independent or independent lives. This highlights the importance of family involvement in fostering personal growth. Down syndrome is a genetic difference, not an illness, and there is no cure. Education is key for development, and while genetics play a role, family, environment, and education equally contribute to a person's progress. Early and continuous education can lead to positive outcomes despite challenges. Families may face difficulties accessing resources, but with perseverance, success is achievable.

We are aware that we live in a digitally advanced environment. In a world going digital, it's become easier and more common to access information. Further advancements in this regard and an improvement in our standard of living have been noted with the advent of Industry 4.0. Industry 4.0 is a next stage of automation and digitization. Numerous sectors have seen changes as a result of this shift. Automation and digitalization are two of this innovation's most significant side effects. Industry 4.0 has resulted in a number of changes, including process optimization, increased productivity, the ability for businesses and individuals to access information more quickly and easily, data storage, cloud computing, fast internet access, research and development oriented innovation, human-machine collaboration, and the growth of the platform economy. It is obvious that these developments will lead to improvements in many areas and an improvement in standard of living. The term "cloud computing technologies" refers to an information technology paradigm that uses the internet to access, store, process, and display computer systems, data, and resources. Users can easily and conveniently access information technology services with this model. A concept known as "cloud computing" offers services in a virtual setting as an alternative to real infrastructure and resources. Because cloud computing technologies are so accessible, people can benefit from having data accessible from several devices or locations. As a result of today's scientific and technical advancements, concepts like Industry 4.0, cloud computing, and digitalization have evolved. These concepts offer many benefits that facilitate progress in many spheres of life and make life easier.

Based on developments in today's world, we can state that we have not been able to create a single location where people can access resources for training, information about Down syndrome, asking and receiving answers to questions, various rights that people have and can utilize, and exchanging experiences. Stated differently, it is apparent that there is a deficiency of a comprehensive support network for people with Down syndrome and their families in the modern world of research and technology. This gap could be addressed by a platform created to enhance these people's quality of life, help their families, and increase social awareness.. Families of people with Down syndrome may frequently encounter challenges when it comes to communicating, exchanging experiences, and getting access to current information. This platform will serve as a hub created to address these requirements. Complexity will be avoided and all types of information will be available to these people, the people in charge of their care, and their families under one roof.

In light of contemporary developments, the absence of a centralized resource can be identified, one in which individuals are able to access training materials, information regarding Down syndrome, opportunities to ask and receive responses to questions, knowledge of various exercisable rights, and channels for the exchange of experiences. Stated differently, it is apparent that there is a deficiency of a comprehensive support network for people with Down syndrome and their families in the modern world of research and technology. This gap could be addressed by a platform created to enhance these people's quality of life, help their families, and increase social awareness.. Families of people with Down syndrome may frequently encounter challenges when it comes to communicating, exchanging experiences, and getting access to current information. This platform will serve as a hub created to address these requirements. Complexity will be avoided and all types of information will be available to these people, the people in charge of their care, and their families under one roof.

Developing a Down syndrome platform harnesses the benefits of current research, development, and technology to provide numerous advantages. One key activity of the platform is knowledge sharing and education, offering families easy access to essential resources and information about Down syndrome. It will also include health-related content, providing up-to-date health information and support from healthcare professionals through publications, manuals, and shared experiences. Additionally, the platform will feature sections about rights and support programs, facilitating families' access to various assistance options. By creating a community for sharing experiences, the platform will improve social communication, raise awareness, and contribute to the well-being of people with Down syndrome and their families.

The development of the Down syndrome platform addresses several key issues, primarily the lack of information among families, healthcare professionals, and the wider public. The platform aims to raise awareness by providing quick access to accurate, up-to-date information. It connects users with essential support services in areas like healthcare, social support, and education, reducing stereotypes and promoting social acceptance. The platform fosters community building, combats social isolation, and strengthens family ties through interactive resources and shared experiences. Ultimately, it seeks to fulfill the diverse needs of families, providing a centralized location for critical information and support. Using the SSADM methodology and systems engineering, this platform aims to enhance access to resources and improve the lives of individuals with Down syndrome.

2. BACKGROUND & LITERATURE REVIEW

2.1 Structured Systems Analysis and Design Methodology (SSADM)

SSADM is recognized as a systematic set of guidelines for systems analysis and design, originally developed in the 1980s by the Central Computer and Telecommunications Agency (CCTA) for application within central government bodies in the United Kingdom. An examination of the evolution of SSADM over time indicates that, although fewer than 20 projects employed the methodology in 1981, its adoption had expanded to more than 600 projects by 1989 [4].

One of the factors contributing to the growing popularity of SSADM in the private sector is that the methodology provides structured solutions to the need for standardized procedures and high-quality system development practices within commercial enterprises. SSADM is commonly characterized as a waterfall methodology. This classification is primarily due to the precise delineation of project stages, in which progression to subsequent phases occurs only after the completion of preceding ones. Additionally, each project stage within SSADM is associated with a distinct set of documentation and procedures, thereby facilitating the management and monitoring of project progress. This characteristic is comparable to the controlled and well-documented structure inherent in the traditional waterfall model. Furthermore, SSADM is described as a waterfall methodology because it emphasizes system analysis and design, and its stages correspond to the primary steps of the waterfall approach, including requirement determination and sequential design execution from project inception. The principal techniques employed within SSADM include dataflow diagrams (DFDs), logical data structures (LDS), entity life histories (ELHs), relational data analysis/third normal form (RDA/TNF), composite logical data design (CLDD), process outlines (POs), logical dialogue outlines (LDOs), first-cut data design (DD), first-cut programs (PROG), and physical design control (PDC) [4].

The three most critical methodologies within SSADM are identified as entity behavior modeling, data flow modeling, and logical data modeling. Logical data modeling is defined as the process through which the data requirements of a system are identified, expressed, and documented throughout the design phase. Information is considered to consist of entities, which are data that a business is required to maintain, as well as the relationships and linkages among these entities. Data flow modeling refers to the process of identifying, expressing, and documenting the movement of data within an information system. Through data flow modeling, the processes that transform data, the data entering and exiting the system, the flows of data, and the locations where data is stored can be systematically analyzed. Entity behavior modeling is described as the process of identifying and documenting the sequence in which events affecting each entity occur.

SSADM divides application development projects into multiple phases, while simultaneously providing several functional benefits. By applying these methodologies, project control and management can be enhanced, higher-quality systems can be developed, computer-based tools such as computer-aided software engineering (CASE) systems can be effectively utilized to support projects, and a structure can be established that promotes efficient communication between both experienced and novice project participants.

SSADM has been employed in numerous projects to achieve objectives such as optimizing the utilization of development personnel. Data flow modeling enables systematic access to data flows in various forms, including data entering and leaving the system and data storage locations. Entity behavior modeling facilitates the determination and documentation of the order in which events impacting each entity occur. Although SSADM segments application development projects into distinct stages, it serves a variety of purposes. Edwards et al. (1989) note that while the SSADM methodology provides standards and guidelines for system development, it does not eliminate the necessity for certified system analysts.

Through the application of SSADM, sufficient logical designs can be developed during the analysis and logical design stages; however, improvements in processes and additional development are required during the physical design phase. SSADM presents both benefits and limitations in the context of information system analysis and design initiatives. A primary benefit of SSADM is its utilization of three distinct methodologies, which enables the determination of the applicability of an information system [4].

Logical data modeling facilitates the identification of system entities and their interrelationships. Data flow modeling assists in determining the entities that provide data to the system, the channels through which the data flows, the transformations that occur, and the locations where data is stored. The purpose of entity behavior modeling is to document how internal business events impact system resources. When SSADM is implemented using these three models, multiple analyses are conducted, allowing the model to achieve

greater accuracy and comprehensiveness. SSADM is recognized as a highly structured approach to information system development, exerting complete control over the entire creation process. Due to its reliance on data analysis, it is noted that changes in the data after the application of SSADM may result in the development of a system that is inconsistent with the current data, even though overall error rates are reduced. One of the most significant advantages of SSADM is its ability to distinguish between the logical and physical components of a system.

2.2 Information Source and Access

Information sources are recognized as playing a critical role in defining all boundaries. The studies cited below were carefully examined, with attention given to the methodologies employed and the technological developments integrated within each investigation. For each article, the focus was placed on understanding how the authors developed their ideas and the approaches they used to address the issues under study.

According to the study conducted by Akkaya (2021), every family member perceives the Internet as a valuable source of information. While online networking is frequently utilized, older siblings exhibit greater concern regarding the timeliness and authenticity of the information obtained. Although the Internet is generally acknowledged for its user-friendly interface and visual appeal, concerns persist regarding online safety and digital pollution, particularly among older family members. Parents often perceive that their children are not utilizing the Internet to its full potential. Social media has been identified as the primary source of information for all family members, which may present challenges to traditional libraries. To mitigate intergenerational disparities and enhance access to knowledge, it is considered essential to prevent online biases, promote lifelong learning, establish fair family Internet norms, and foster open communication regarding individual Internet perceptions. Inclusion of all generations is deemed necessary for accurate predictions and effective solutions. Collaborative efforts among families, formal education, and informal learning environments are required to enhance children's Internet literacy, empower future users, and facilitate the integration of conventional knowledge sources. By implementing these recommendations, it is anticipated that the perception gap can be bridged, providing all users with a more efficient and informed online experience [17].

Determination of the tools utilized and the manner in which they are applied represents a key area of inquiry. According to Şakir Özüdoğru (2014), blogs, which originated as private online journals in the early 2000s, have evolved into influential instruments impacting politics, education, marketing, and media. They facilitate citizen journalism, thereby democratizing the news-gathering process and contributing to a more vibrant public sphere. However, concerns persist regarding source credibility and potential bias, necessitating careful navigation of this new information environment. Political blogs, similarly, serve as forums for campaigns and discussions, promoting civic participation and engagement, yet they also carry the risk of disseminating false information and reinforcing echo chambers, which underscores the importance of fact-checking and responsible user participation. In educational contexts, blogs provide digital natives with dynamic learning environments that foster collaboration and independent study. Nonetheless, disparities in Internet access exacerbate socioeconomic and cultural inequalities, highlighting the need for equitable access and inclusive design. In marketing, blogs allow businesses to target specific audiences and cultivate individualized customer relationships. Yet the susceptibility to misinformation and smear campaigns necessitates rigorous content verification and ethical marketing practices. In conclusion, blogs present both significant challenges and substantial opportunities. To ensure that blogs fulfill their potential as enlightening and liberating resources across multiple social sectors, it is essential that future research and conscientious user engagement critically address these complexities [19].

2.3 Information Technologies and Systems

Information technologies and systems continue to represent a highly relevant topic, yet the creation and application of such systems remain complex and challenging. Various procedural steps can be observed within this domain, and comprehensive research is required to achieve more detailed and robust studies. Inadequate specification of parameters, boundaries, variables, and constraints may result in the

development of systems that fail to address the problems they are intended to solve. Kalıpsız (1989) posits that the insufficiency of information systems in Türkiye is largely attributable to inadequate data utilization and analysis. The adherence to systematic rules during the development and creation of information systems is considered essential to mitigate these issues. The development process of information systems typically involves three stages: review and analysis, system design, preparation and completion. Advances in fourth-generation programming languages and computer software have enhanced system analysis and design; however, organizations frequently purchase computers without conducting comprehensive assessments, leading to underutilization. System development, also referred to as "system analysis and design," is defined as the process of creating management information systems, which requires extensive research. Challenges encountered include unplanned modifications to computing resources and the slower pace of software development relative to hardware. Despite technological improvements, conventional system design and analysis methodologies remain relevant. For instance, the General Directorate of Forestry in Türkiye continuously evaluates and improves the performance of its information system, emphasizing the need for a systematic approach to ensure that information systems are properly utilized and meet organizational requirements [16].

Tecim (1999) further highlights that the phases of information systems (IS) encompass data collection, storage, processing, analysis, and presentation. In this study, geographic information systems (GIS) were integrated as a technological tool within IS. Information technology (IT) is defined as the combination of technologies enabling data collection and analysis required by IS. GIS, which allows for spatial analysis using location-based data, is particularly compatible with IS. It is widely applied in planning, management, and research, including transportation, urban, regional, and environmental planning. In management, GIS supports tasks related to security, natural resource management, land management, and disaster response. Moreover, GIS is utilized in research across disciplines such as geography, geology, archaeology, and environmental studies. By leveraging location-based data, GIS facilitates more precise and comprehensive analyses and enhances decision-making. Specific applications include map creation, asset location tracking, natural resource monitoring, disaster-prone area identification, wildlife population tracking, climate change analysis, and archaeological site mapping. In summary, GIS plays a critical role within IS by enabling efficient use of location-based data in a variety of contexts [17]. The application of information systems extends to multiple industries. Onay (1998) emphasizes the importance of IS in the healthcare sector, where health data can be collected, processed, and managed to support informed decision-making. The significance of information systems in healthcare can be summarized as follows:

- Expanding service coverage: Information systems facilitate the provision of health services to larger populations. For example, the automatic tracking of birth dates and follow-up visits during home visits enables the monitoring of maternal health.
- Reducing costs and increasing efficiency: IS contributes to cost reduction and the effective utilization of labor. Efficient use of IT in hospitals, for instance, reduces administrative burdens on physicians and nurses, allowing more time for direct patient care.
- Enhancing patient services: IS ensures the delivery of more effective and high-quality healthcare services, such as reviewing medication interactions before prescription.
- Improving resource management**:** IS enables more accurate monitoring and allocation of materials and equipment, ensuring efficient resource utilization.

In Türkiye, the Ministry of Health developed the Health Information System (HIS) to promote the adoption of IT within the healthcare sector. HIS ensures national-level collection, processing, and management of health data, thereby providing healthcare managers with accurate and up-to-date information for improved decision-making. Consequently, the implementation of information technologies in healthcare is critical for enhancing service effectiveness and quality [20].

2.4 Structured System Analysis and Design Methodology

Üstünyer (2019) benefited from this structure in his study to better understand the SSADM structure. The first level (departmental level) is the highest level. Its subcomponents constitute the second level (functional level). The third level is the lowest level and is stated as the user requirements level [21].

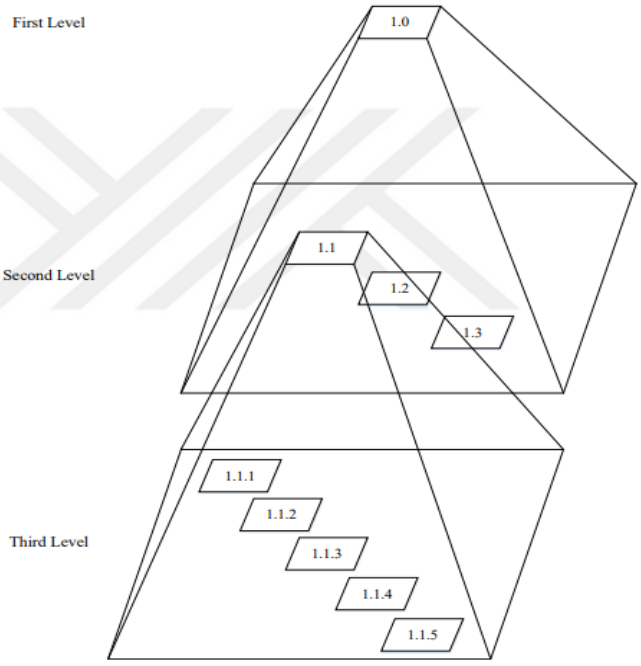

Figure 1. SSADM Structure (Ustunyer, 2019)

In the course of the study's development, the authors' approach to SSADM was systematically examined. Gassert (1990) supported the model developed in his study through the application of structural analysis tools. It has been suggested that nurses are increasingly involved in decisions regarding the acquisition or development of information systems. Nurses without prior informatics experience may require support in defining precise requirements for nursing information systems (NIS). To provide a structured framework for determining NIS requirements, the Model for Defining Nursing Information System Needs was developed. The model was created using structural analysis methodologies. A survey involving seventy-five registered nurses, who had previously made judgments regarding NISs, was conducted to evaluate the model. The participants endorsed the model's validity and effectiveness in accurately identifying NIS requirements [10].

In a study from a different domain, Wilson et al. (2009) utilized transmission electron microscopy (TEM) to analyze the structure of graphene oxide (GO). The underlying carbon lattice was observed to preserve the order and lattice spacing of graphene, as evidenced by electron diffraction. These results further demonstrated that GO monolayers provide exceptional support films for TEM analysis of macromolecules and nanoparticles due to their high stability under the electron beam and electron transparency. The structural analysis of the iron-storing protein physiological ferritin served as supporting evidence. The TEM studies provided insights into the carbon lattice structure in GO while highlighting the material's suitability as a support film for TEM applications [11].

Applications of SSADM have been observed across multiple sectors. Akyüz, Temiz, and Veziroğlu (2020) presented a case study on the system analysis and design process conducted within a textile company. The system analysis evaluated the current operational state and identified issues affecting the enterprise. Data mining techniques were subsequently integrated to address the primary problem identified: "The reports

generated by commercial software were insufficient to meet strategic objectives and failed to satisfy management requirements." Database integration within the organization was achieved, and required management-level reports were generated using the data mining application. This reporting system enabled company-specific evaluations and facilitated evidence-based decision-making, enhancing operational control and organizational efficiency [13].

In another domain, Saldanha and Eccles (1991) applied SSADM to analyze the logical structure of proteins, demonstrating its utility in decomposing complex projects into smaller components. Using the computer-aided software engineering (CASE) tool Auto-mate, a logical design capturing the main protein structures and a detailed design encompassing secondary and tertiary structures were developed. Auto-mate embodied the SSADM methodology by enabling logical system design and allowing the determination of system requirements from the logical model prior to constructing the final physical system. This approach facilitated the development of large-scale information systems, including databases and knowledge bases, by translating expert conceptualizations into computer-implementable knowledge-based systems [1].

Further applications of SSADM have been reported. Aggelinos and Katsikas (2011) integrated SSADM with disaster recovery plan (DRP) activities to concurrently design a smaller DRP system alongside routine operations. This methodical integration provided benefits in cost, employee experience, response time, talent management, and organizational competitiveness, while significantly reducing the time required to implement the emergency operations system [2]. Bolloju (1997) explored the transformation of SSADM application requirements into object-oriented specifications, proposing a methodology to transition information systems development from structured approaches to object-oriented software development (OOSD). The study emphasized target methodology selection, mapping rule definition, and reuse assessment, aiming to facilitate the transfer of information systems expertise through education and training [3].

Edwards, Thompson, and Smith (1989) reported on SSADM application within UK government agencies and the private sector, analyzing its utilization, perceived value, challenges, and adherence to component stages. Findings indicated that a structured interface between SSADM and system implementation would be beneficial, highlighting the need for automated tools to support SSADM design and maintenance. The methodology was found to be flexible and adaptable to user needs while increasingly adopted in the private sector as an industry standard [4].

Middleton (1999) investigated the practical efficacy of SSADM as a prescriptive systems development methodology within the UK government. Observations and interviews with end-users and project managers revealed that while SSADM provides structured approaches, project-specific adaptations and attention to soft organizational factors were necessary for effective staff management and strategic decision-making. The methodology contributed political protection and administrative control over complex software development processes, thereby benefiting the public sector [5].

Rogerson, Weckert, and Simpson (2000) examined the ethical implications of rapid technological advancement and noted that most information systems development tools focus primarily on technical problems. SSADM, while effective as a formal development methodology, requires enhancement to adequately address ethical considerations. The Australian Computer Society's Code of Ethics was applied as a benchmark for identifying potential updates to SSADM processes, emphasizing the importance of integrating ethical standards throughout system development [6].

Woolridge, Morrissey, and Phillips (2004) applied SSADM to develop strategic and tactical tools for waste management within large organizations, including a case study on healthcare waste in the UK. Functional components of SSADM were adapted to create waste flow diagrams and monitor waste generation and flows in hospitals, demonstrating the methodology's applicability in complex operational environments [7].

Finally, Timurtürkan (2019) examined how digital media and technology shape modern motherhood. Private parenting websites and applications were identified as significant tools for sharing experiences,

seeking advice, and forming support networks among new and expecting mothers. The study employed qualitative content analysis of the website "anneysen.com," revealing how motherhood is commodified and how digital platforms facilitate the exchange of parenting experiences, information, and social support [8].

2.5 Individuals with Special Needs, Parenthood

Özsoy, Özkahraman, and Çallı (2006) investigated the challenges encountered by families with children who have mental disabilities. It was observed that as the gap between familial expectations and reality widens, families experience greater difficulties in coping with the actual situation. This descriptive research study involved a total of 180 mothers and fathers of mentally disabled children, aiming to identify the challenges faced by these families and to examine the relationship between sociodemographic factors and the difficulties experienced. Following interviews with parents, 110 participants who consented to take part in the study formed the sample group. Research data were collected using forms developed by the researchers. Findings indicated that 54.5% of families experienced continuous anxiety about the future, 48.2% were constantly fearful of accidents or injuries to the child, and 37.3% reported a lack of social support from their community. It was concluded that it is inappropriate to leave families with mentally challenged children to manage their emotions and issues independently. Consequently, public health nurses are recommended to prioritize the planning and implementation of interventions aligned with the requirements of these families in their nursing practices [12].

Toker, Başgül, and Özaydın (2019) examined the assessment of needs and perceptions of social support among families with children who have Down syndrome. Twenty mothers from Gaziantep participated in the study. Data were analyzed from interviews conducted with the parents. The results demonstrated that families require social, psychological, financial, and informational support, in addition to therapy and other family-related necessities. It was also reported that, while support is sometimes provided by friends and relatives (e.g., grandparents), societal discrimination and inadequate assistance from specialists remain significant concerns for mothers [9].

Manzoor and Vimarlund (2018) highlighted the potential of information technology as a facilitator of social participation for individuals with disabilities. However, they noted that the objectives established by institutions such as the European Commission have not yet been fully realized. The study aimed to investigate the types of digital services and/or applications based on information and communication technology that are proposed to promote social inclusion for individuals with various disabilities. According to the findings, no consistent patterns exist regarding the specific technologies or technical advancements that can support social integration. The study emphasized the need to identify areas requiring further research and considerations to be addressed when developing and applying technological solutions intended to enhance social engagement for people with disabilities [14].

Ammari and Schoenebeck (2015) examined the challenges faced by parents of children with special needs in navigating complex service networks and procedures to obtain essential care. A total of 43 interviews were conducted with parents to determine whether social media platforms facilitated their caregiving responsibilities. The study revealed that parents were able to gain nearly instantaneous access to other parents on platforms such as Facebook, enhancing their ability to share information and strategies. The concept of networked empowerment was introduced to better understand how parents connect with one another, access information, and identify innovative approaches to support health advocacy among caregivers at both local and national levels. Design recommendations were provided to enable caregivers to obtain information and support more efficiently and effectively [15].

3. IMPLICATIONS & RESULTS

3.1 Why SSADM?

Taking all of this information into consideration, the rationale for developing the platform using the SSADM methodology was established, as this approach necessitates a comprehensive requirements

analysis at the outset of the project. The identification of features supporting the platform's objectives requires a thorough understanding of the needs, expectations, and unique characteristics of individuals with Down syndrome and their families. Consequently, the platform can be developed in a manner that more accurately addresses the actual needs of its users. According to SSADM guidelines, the system is recommended to be divided into modular components. Additional modules catering to the diverse requirements of people with Down syndrome and their families can thus be incorporated, enhancing the platform's adaptability, scalability, and manageability. Examples of such modules include community forums, health information sections, and educational modules. It is emphasized that the platform must be accessible and comfortable for users with Down syndrome and their families. SSADM promotes considerations of usability and accessibility, ensuring that the platform is user-friendly and appealing to a wide range of users. Detailed documentation is required at every stage of SSADM, facilitating the understanding and resolution of issues that may arise during platform development and maintenance. By establishing standards, the methodology allows the development team to operate with greater consistency. Quality control is emphasized throughout every phase of the project, ensuring reliable, error-free, and consistent platform performance. The platform's success is contingent upon providing trustworthy resources to individuals with Down syndrome and their families. SSADM further recommends segmenting the project into phases to allow manageable completion of tasks. This approach facilitates project management and ensures that each stage remains goal-oriented. During these phases, additional attention can be devoted to addressing the specific needs of individuals with Down syndrome and their families. The SSADM methodology can be applied to the development of a Down syndrome platform to streamline project processes, generate a design aligned with objectives, and maintain quality control. Through this approach, platform users can derive maximum benefit, and the project can be completed efficiently via a structured system development process.

Table 1 has been created to show which articles are determined to identify the structure of theoretical framework and which parts of the studies have been used.

Table 1. Article review finding

Article	Year	Findings
Perception of Internet as an Information Source and a Tool of Access to Information: Comparison of Approach Differences Between Generations [17]	2021	Family members' perspectives on the Internet require intergenerational collaboration to access reliable information.
Sistem Analizi ve Tasarımı: Bir Tekstil Firmasında Veri Madenciliği Uygulaması [13]	2020	The system analysis and design process in the textile company provides logical decision-making ability for management by integrating internal data and overcoming insufficient commercial software reports with data mining.
Down Sendromlu Çocuğa Sahip Annelerin Aile Gereksinimlerinin Belirlenmesi ve Sosyal Destek Algılarına Yönelik Görüşleri [9]	2019	Families with children with Down syndrome struggle with social, psychological, financial and informational support needs, as well as discrimination and inadequate professional support.
Parenthood and the Digital Media: New Representations of Maternity and Solidarity Patterns [8]	2019	Digital platforms reshape maternal identity and motherhood experience; in the case of anneysen.com, the study touches on consumer culture and mothers' need to share loneliness and experiences.
Digital Technologies for Social Inclusion of Individuals with Disabilities [14]	2018	Current information technologies do not sufficiently support participation of disabled people in social life; types of supportive technologies and critical considerations are identified.
Networked Empowerment on Facebook Groups for Parents of Children with Special Needs [15]	2015	Social media platforms enable health advocacy by parents of children with special needs through mutual support.

Table 1. Article review finding (continue)

Article	Year	Findings
Blogs as A Web 2.0 Application: Dynamics of Blogs and Blogosphere [19]	2014	Blogs ease information sharing but also increase the risk of spreading false information.
Enhancing SSADM with Disaster Recovery Plan Activities [2]	2011	Integrating SSADM with disaster recovery planning enables faster and more efficient disaster-prepared information system design.
Graphene oxide: structural analysis and application as a highly transparent support for electron microscopy [11]	2009	Structural analysis shows graphene oxide maintains lattice order, offering high transparency and stability, making it an excellent TEM support film.
The development of strategic and tactical tools, using systems analysis, for waste management in large complex organisations: a case study in UK healthcare waste [7]	2005	Strategic and tactical waste management tools can be developed using SSADM-modified methods to improve hospital waste management.
An ethical review of information systems development – The Australian Computer Society's code of ethics and SSADM [6]	2000	There is a gap between technology development and social policy; SSADM and similar methodologies provide insufficient ethical support and need moral strengthening.
Managing information system development in bureaucracies. Information and Software Technology [5]	1999	SSADM offers an organized approach to IS development and is useful in the public sector, but falls short in people management, user communication, and handling strategic uncertainties.
Bilgi Teknolojilerinde Yeni Bir Gelişme: Coğrafi Bilgi Sistemleri ve Bilgi Sistemleri Arasındaki Yeri [18]	1999	Geographic Information Systems integrate with other IS to support better decision-making by employing location-based data for more accurate analyses.
Sağlık Sektöründe Bilgi Sistemleri [20]	1998	In healthcare, information systems expand service areas, improve efficiency, enhance patient care, and optimize resource management.
An Approach to Transformational Reengineering of SSADM Application Specifications to Object-Oriented Specifications [3]	1997	Converting SSADM applications into object-oriented specifications helps firms transition to object-oriented technology more economically and sustainably.
Zihinsel Engelli Çocuk Sahibi Ailelerin Yaşadıkları Güçlüklerin İncelenmesi ve Durumlarındaki Değişikliklerin Saptanması [12]	2006	Families with mentally disabled children face anxiety, fear, lack of social support, and many difficulties, highlighting the need for interventions.
Structured analysis: Methodology for developing a model for defining nursing information system requirements [10]	1990	A model was developed to let nurses actively choose IS and determine needs using structural analysis; effectiveness was tested.
The application of SSADM to modelling the logical structure of proteins [1]	1991	SSADM facilitates the design of protein structure analysis by dividing complex systems into parts.
Bilişim Sisteminin Geliştirilmesi (Sistem Analizi ve Tasarımı) [16]	1989	System analysis and design is vital in IS development to prevent inadequate systems and ensure efficiency.

Figure 2 states that how articles have been distributed via different research areas. SSADM studies have been investigated well to determine how we are going to create the structure of the platform. It can be clearly understood that no study for individuals with special needs can be seen to much to create a platform with systematic design. Not only with Down syndrome but also autism and different kind of genetic anomalies can be studied under this topic.

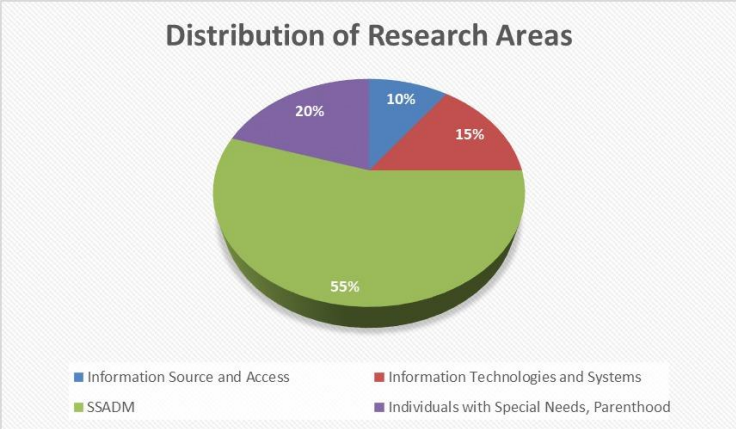

Figure 2. Distribution of literature review

Figure 3 shows how the articles studied year by year. Generally, we have a stable number but, for 2 and 3 years no study has been developed.

In the details of the study, the system's component elements are represented as Activity Boxes, which are essential for the proper functioning of the system. The quantity of activity boxes is indicated by activity numbers. Data flow is illustrated using information flow arrows. Customers are represented by the outsourcing icon, and data storage is incorporated using the standard store icon. These SSADM components facilitate the creation of a broad, non-detailed template in accordance with the SSADM approach employed.

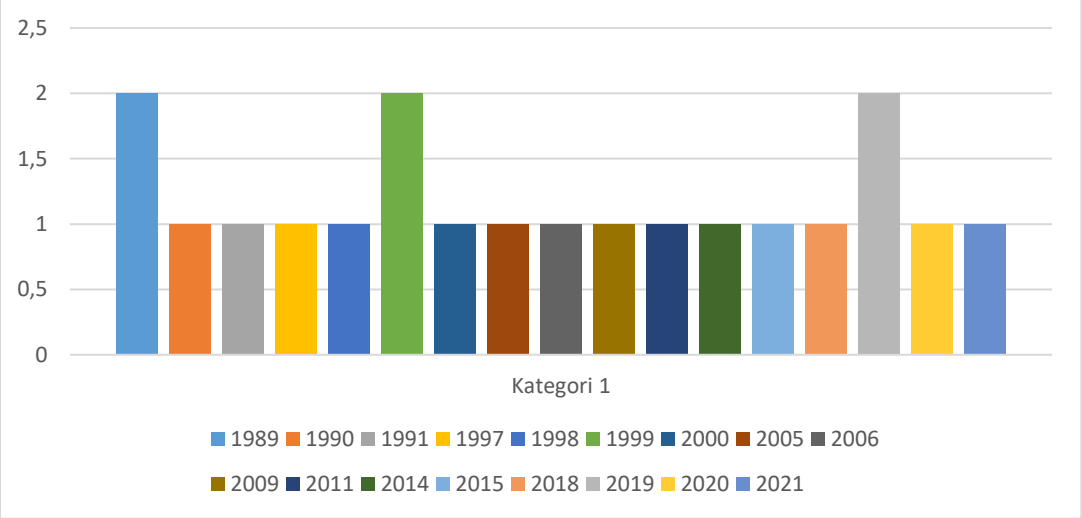

Figure 3. Article publication review

The number of components is expected to increase in the subsequent phases of the project as a more comprehensive methodology is developed. The titles obtained within the established framework have been presented based on the structure observed in platform studies reported in the literature. The boundaries of the entire system are defined by this scheme, as shown in Figure 4. The web-platform management system developed for this study consists of two primary components: Management and Service. Through various data flows, the process from management to the delivery of services to the customer is delineated.

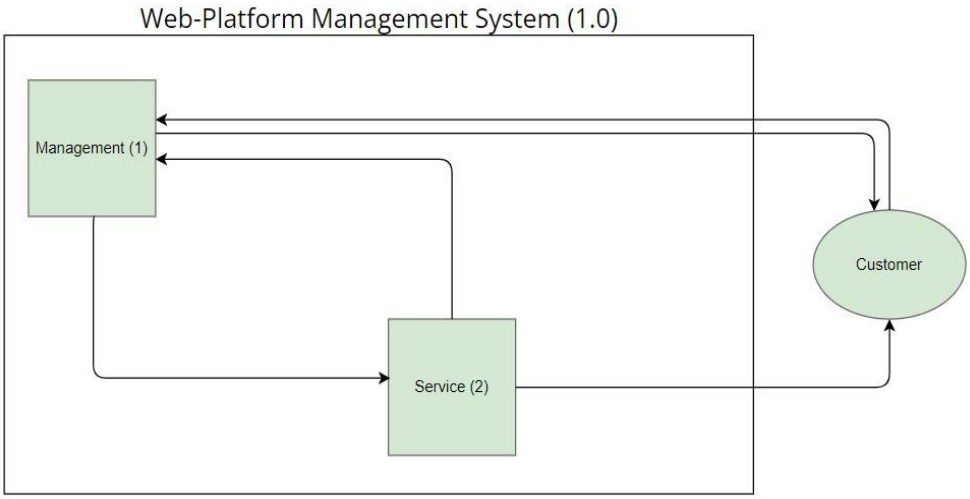

Figure 4. Web-Platform management system

(1) Output: Work order, schedule, revision from "administration" to "services".

(2) Input: Approval request report of edited content from "services" to "administration".

(3) Output: Feedback survey and request and complaint form from "customer services" to "customer".

(4) Input: Feedback and request and complaint from "customer" to "customer services".

(5) Output**:** Prepared and compiled contents from "publishing" to "customer".

In this period of our study, we will include the boundaries of the entire system and the other components included in the two main components, management and service (Figure-5 & Figure-6). Critical components have been shown below (Figure-6, 7, 8, 9, 10) by specifying the input outputs of these systems and creating subsystems of management and service as theoretical framework of SSADM approach.

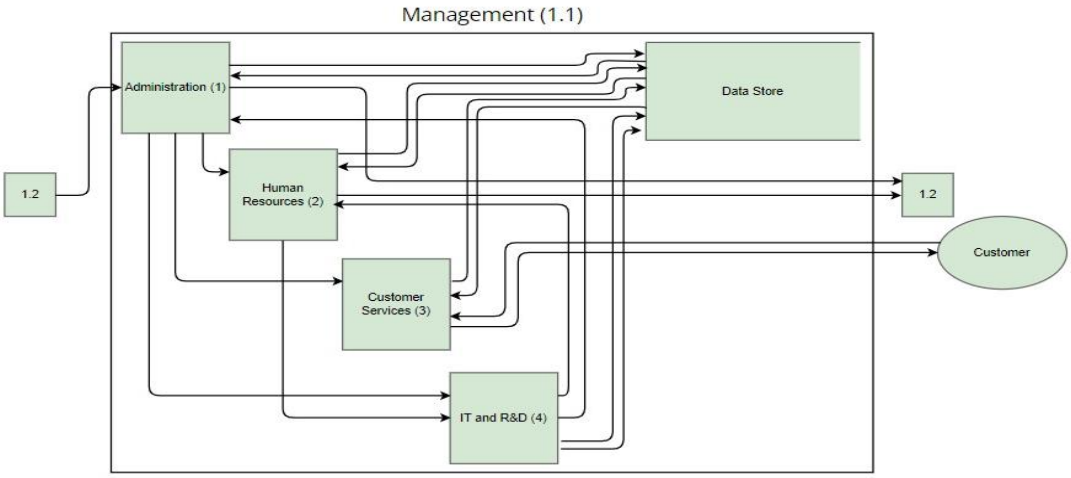

Figure 5. Management structure

(1) Output: Work order, schedule, revision from "prepare work order" to "services".

(2) Input: Approval request report of edited content from "services" to "check reports".

(3) Output: Feedback survey and request and complaint form from "customer services" to "customer".

(4) Input: Feedback and request and complaint from "customer" to "customer services".

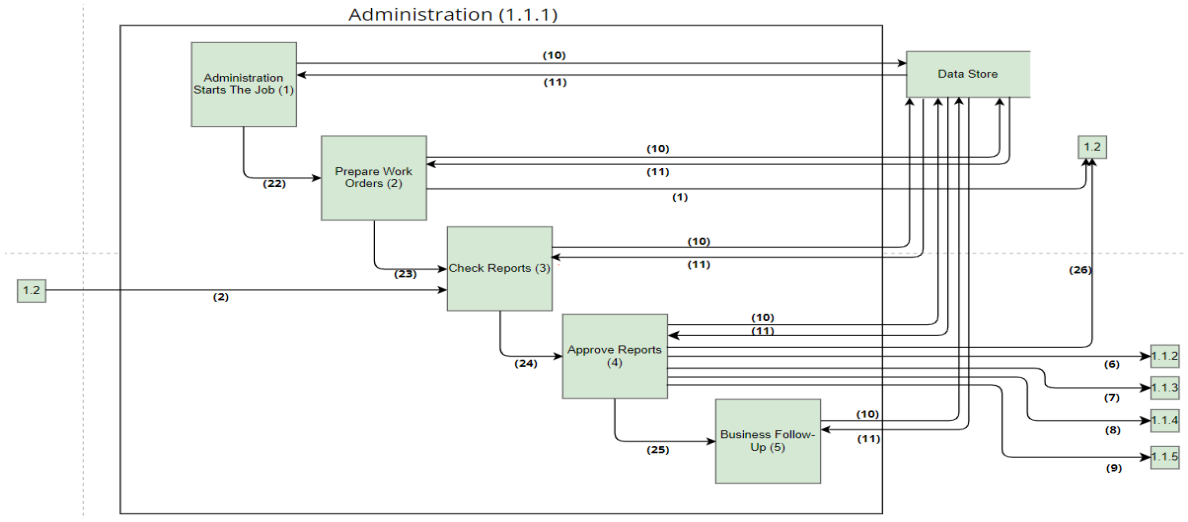

Figure 6. Administration structure

(1) Output: Work order, schedule, revision from "prepare work order" to "services".

Work order contains:

- Document number,
- Document date,
- Page number,
- Number of works,
- Responsible worker,
- Explanation.

(2) Input: Approval request report of edited content from "services" to "check reports".

Approval request report of edited content addresses:

- Report number,
- Report date,
- Type of content,
- Number of sources researched,
- Title of content,
- Outline of content,
- Information about the responsible person,
- Notes.

(6) Output: Recruitment order from "approve reports" to "human resources".

Recruitment order contains:

- Number of people to hire
- Task definition

(7) Output: Feedback survey order from "approve reports" to "customer service".

(8) Output: Approved research and development offer form from "approve reports" to "IT and R&D".

(9) Output: Approved finance report from "approve reports" to "finance".

Approved finance report contains:

- Approve date
- Report name
- Report number
- Evaluation
- Financial statement date
- Financial statement title
- Financial statement period
- Accounting policies

(10) Output: Controlled and approved reports from "administration" to "data store".

(11) Input: After each job is done, information flow is provided between the data store and the administration in order to ensure traceability and recording and to minimize paperwork.

It covers:

- "data store" to "administration starts the job",
- "data store" to "prepare work orders",
- "data store" to "check reports",
- "data store" to "approve reports",
- "data store" to "business follow-up".

(26) Output: Approval of the content submitted for approval for publication from "approve reports" to "services".

Administration Starts the Job: It is the stage where the administrator starts the work.
Check Reports: The reports are checked in this section before going for approval.
Approve Reports: The administrator reviews the reports and gives approval at this step.
Business Follow-up: This is the part where job tracking takes place.

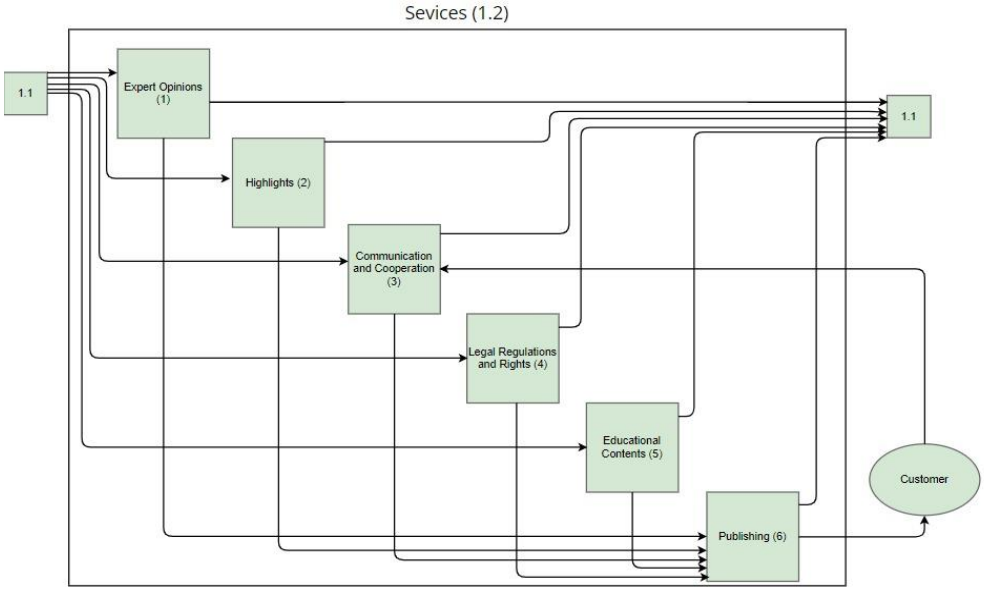

Figure 6. Service structure

(1) Input: Work order, schedule, revision from "prepare work order" to "services".

(2) Output: Approval request report of edited content from "services" to "check reports".

(5) Output: Prepared and compiled contents from "publishing" to "customer".

(20) Output: Prepared and compiled contents from “publishing” to “administration”.

(40) Output: Forum contents from “communication and cooperation” to “customer”. Messaging services from “communication and cooperation” to “customer”.

(41) Input – User activities from “customer” to “communication and cooperation”.

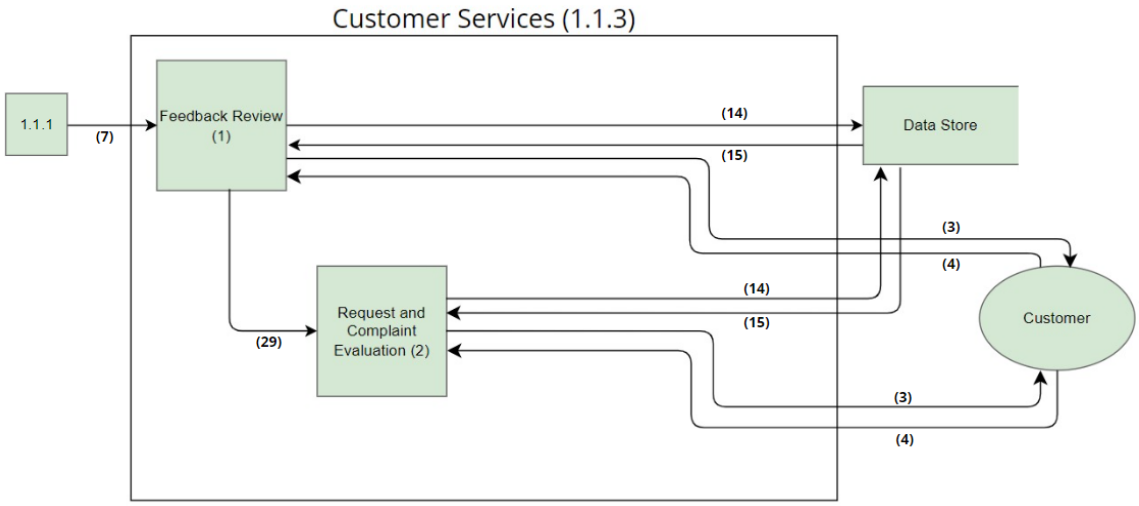

Figure 7. Customer service structure

(3) Output: Feedback survey and request and complaint form from “customer services” to “customer”.

(4) Input: Feedback and request and complaint from “customer” to “customer services”.

(7) Input: Feedback survey order from “approve reports” to “customer service”.

(14) Output: Content prepared for feedback and requests and complaints from “customer services” to “administration”.

(15) Input: Content ready to be provided for feedback and requests and complaints from “administration” to “customer services”.

- Feedback Review: Responses are collected by conducting studies to obtain feedback from users.
- Request and Complaint Evaluation: Requests and complaint notifications received from users are examined and evaluated.

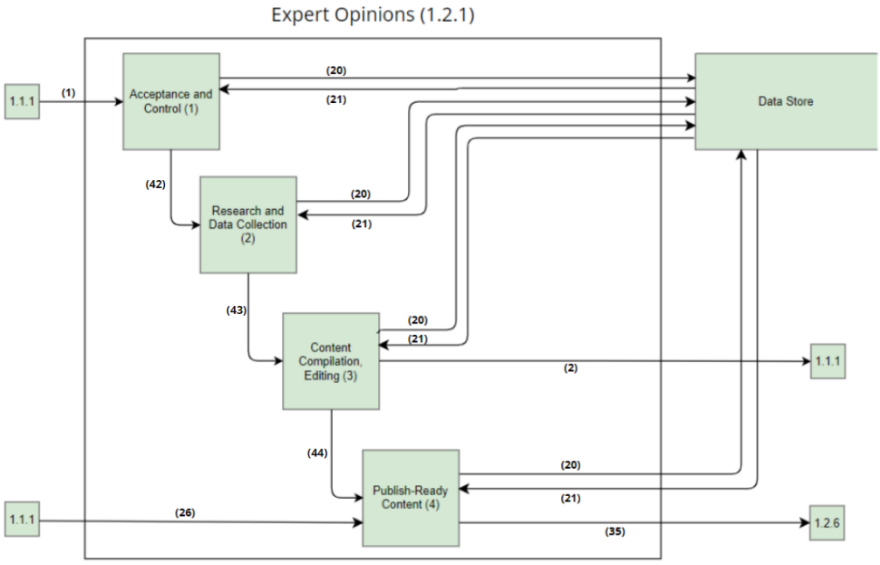

Figure 8. Expert opinion structure

(1) Input: Work order, schedule, revision from "administration" to "acceptance and control".

(2) Output: Approval request report of edited content from "content compilation, editing" to "administration".

(20) Output: Prepared and compiled contents from "publishing" to "administration".

(26) Input: Approval of the content submitted for approval for publication from "administration" to "publish-ready content".

(35) Output: Approval information and content ready to be published from "publish-ready content" to "publishing".

- Acceptance and Control: Acceptance and preparation of the job takes place at this stage.
- Research and Data Collection: Collecting the data necessary to prepare content from appropriate sources.
- Content Compliation, Editing: It is the stage of preparing a compilation text appropriate to the content from the collected sources.
- Publish-Ready Content: Sending approved and ready-to-publish content to the publishing unit.

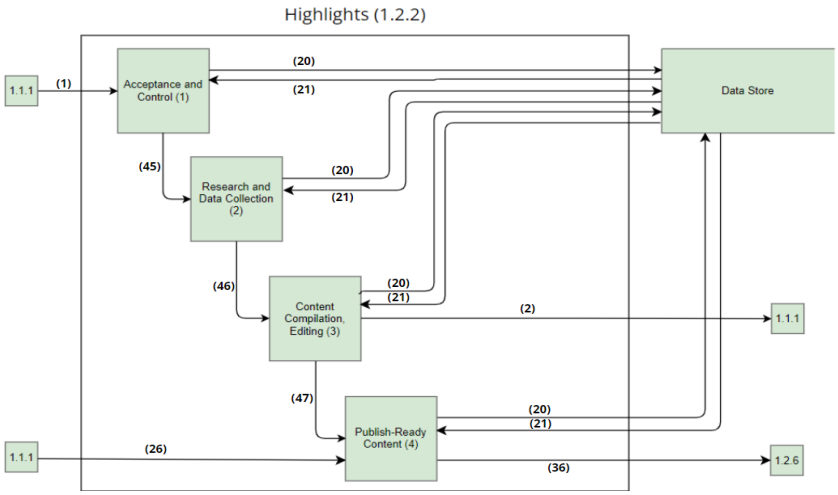

Figure 9. Highlights structure

(1) Input: Work order, schedule, revision from “administration” to “acceptance and control”.

(2) Output: Approval request report of edited content from “content compilation, editing” to “administration”.

(20) Output: Prepared and compiled contents from “publishing” to “administration”.

(26) Input: Approval of the content submitted for approval for publication from “administration” to “publish-ready content”.

(36) Output: Approval information and content ready to be published from “publish-ready content” to “publishing”.

- Acceptance and Control: Acceptance and preparation of the job takes place at this stage.
- Research and Data Collection: Collecting the data necessary to prepare content from appropriate sources.
- Content Compliation, Editing: It is the stage of preparing a compilation text appropriate to the content from the collected sources.
- Publish-Ready Content: Sending approved and ready-to-publish content to the publishing unit.

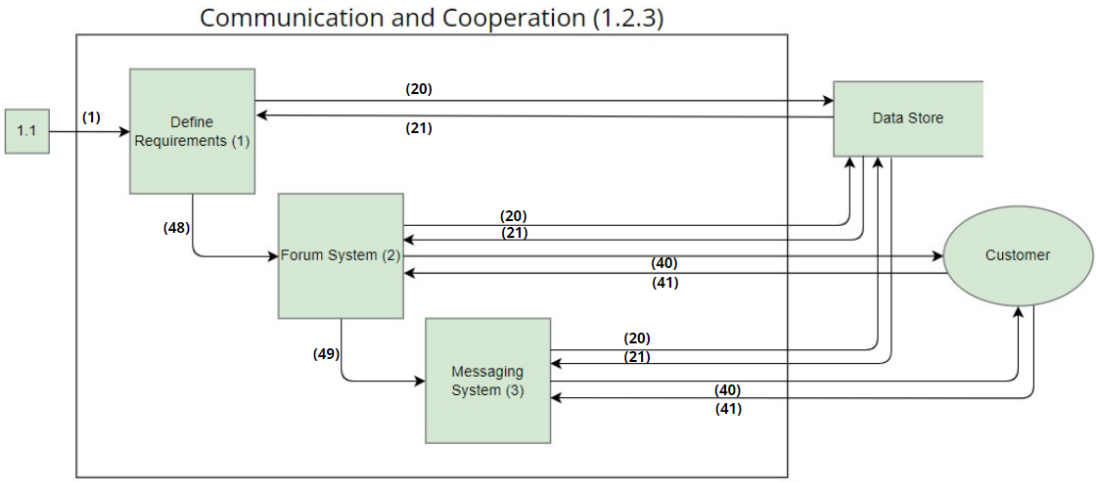

Figure 10. Communication & cooperation

(1) Input: Work order, schedule, revision from “administration” to “define requirements”.

(20) Output: Prepared and compiled contents from “messaging system” to “administration”.

(40) Output: Forum contents from “communication and cooperation” to “customer”.

- Messaging services from “messaging system” to “customer”.

(41) Input: User activities from “customer” to “forum” and “messaging system”.

Another step involves the creation of a Function Flow Block Diagram (FFBD). An example of the FFBD designed for the system is presented in Figure 11. This FFBD example incorporates the "Research and Data Collection" component, which corresponds to the second step of the Service's Educational Contents (1.2.5) structure, developed using the SSADM methodology. The utilization of FFBD within structured system design methodologies such as SSADM allows the system to be better comprehended, managed, and effectively designed. Accordingly, in this study, the system structure was made more understandable through the implementation of an FFBD example.

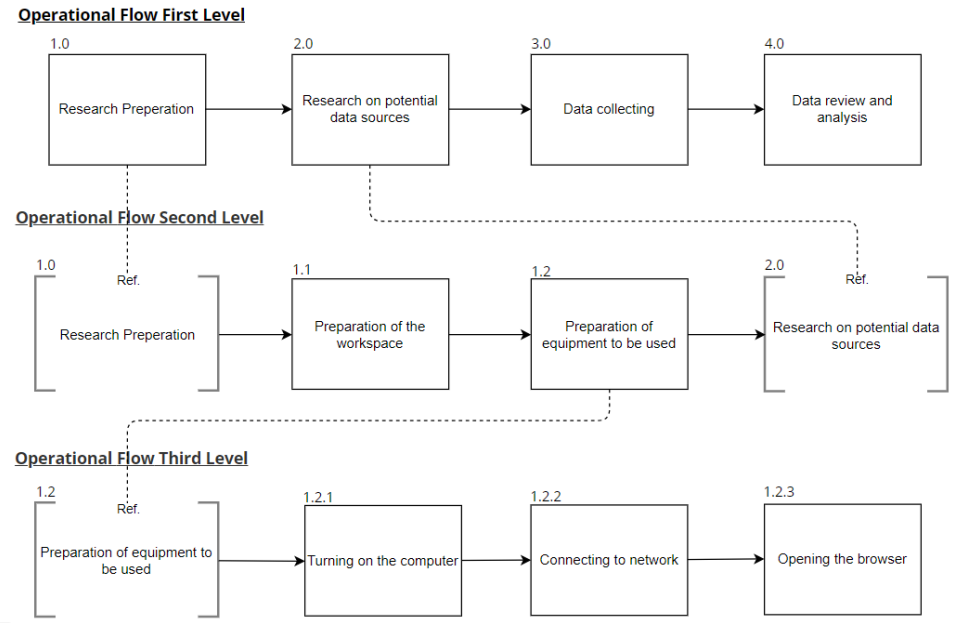

Figure 11. FFBD example

With the aid of SSADM, the project was initially divided into multiple stages, and upon the completion of each stage, progression to the subsequent stage was carried out in accordance with the methodology. These stages encompassed activities such as the determination of project requirements, system design, and implementation. Data flows, processes, data stores, and data movements within the information system were defined using data flow diagrams as part of the SSADM methodology. This facilitated an understanding of data inputs and outputs in the system, as well as the processing of data. Detailed documentation was maintained at every stage of SSADM. Data flows were identified and numbered, and for each subsystem, explanations of the stages were provided sequentially. The designed system follows a general-to-specific approach in line with the SSADM methodology.

The Web-Platform Management System represents the most general structure of the system and is designated as 1.0. This structure includes the Management and Service components, with connections to the customer clearly depicted. The Management structure was labeled as 1.1, whereas the Service structure was labeled as 1.2.

The Management subsystem was designed using SSADM and comprises Administration, Human Resources, Customer Service, IT and R&D, and Finance management. Connections between these units and the data store, customer, and service were mapped, and data flows were numbered and explained. Within Management, Administration (1.1.1) consists of the stages: initiation of administration tasks, report checking, report approval, and business follow-up. Human Resources (1.1.2) includes recruitment, training, and personnel evaluation stages. Customer Service (1.1.3) encompasses feedback review and request/complaint evaluation stages. IT and R&D (1.1.4) incorporates the steps of requirement definition and research and development. Finally, Finance (1.1.5) involves service and equipment procurement, accounting, advertisement, and support/sponsorship operations. Connections and data flows among these units were represented in SSADM diagrams, with flows numbered and annotated for clarity.

Following the design of the Management subsystem, the Service subsystem (1.2) was structured to include Expert Opinions, Highlights, Communication and Cooperation, Legal Regulations and Rights, Educational Contents, and Publishing. Expert Opinions (1.2.1) involves the stages of acceptance and control, research and data collection, content compilation, editing, and preparation for publication. Highlights (1.2.2), Legal Regulations and Rights (1.2.4), and Educational Contents (1.2.5) follow similar stages, as content is created under the respective titles, reviewed, and published on the platform. Communication and Cooperation

(1.2.3) includes the stages of requirement definition, forum systems, and messaging systems. Finally, Publishing (1.2.6) consists of requirement definition and publication activities. For all components of the Service subsystem, connections and data flows were numbered and stages briefly explained to ensure clarity and traceability.

4. CONCLUSION

Technological advancements have significantly facilitated access to knowledge, with the Internet emerging as a major information source, particularly through information technologies. Web-based platforms now expose individuals to content organized around specific themes. In this study, the primary objective was to develop a platform that raises awareness and provides support for individuals with Down syndrome and their families. Through an extensive literature review, several challenges were identified, including the absence of reliable and centralized information sources, difficulties in family communication, and limited access to support services. To address these challenges, a platform was developed using the SSADM methodology, aiming to provide a comprehensive website that consolidates essential services and resources for individuals with Down syndrome and their families.

As the project progresses, efforts are being made to expand and refine the SSADM-based system, enhancing its comprehensiveness and detail. The methodology has proven highly beneficial in the initial development phases and provides a structured framework for subsequent progress. The application of SSADM in the platform's development has yielded multiple positive outcomes, including improved family support, enhanced social interaction, educational advancement, increased advocacy and awareness, and integration of technological innovations.

By providing a centralized hub for information and services, the platform significantly reduces the burdens faced by families of individuals with Down syndrome. Access to accurate, up-to-date, and comprehensive information enables informed decision-making regarding care and support. In terms of social interaction, the platform fosters community engagement by offering features such as forums and messaging systems, allowing families to share experiences, seek advice, and provide mutual support, thereby reducing isolation and reinforcing social bonds.

Educational outcomes are supported through tailored resources and materials, ensuring that individuals with Down syndrome receive appropriate educational assistance. This contributes to enhanced academic performance and greater independence. Furthermore, the platform promotes advocacy and awareness by providing information on legal rights and social programs, empowering families to assert their entitlements and facilitating the social inclusion of individuals with Down syndrome. The integration of advanced technological tools, including cloud computing and digital platforms, ensures that the system aligns with Industry 4.0 principles, enhancing efficiency and adaptability to future technological developments.

In conclusion, the SSADM-based digital platform offers a comprehensive solution to the challenges faced by individuals with Down syndrome and their families. The structured and systematic nature of SSADM has ensured that the platform is user-friendly, adaptable, and reliable. The outcomes highlight the potential of such platforms to improve the quality of life for individuals with Down syndrome by providing centralized resources and support. Future research should focus on further enhancing the platform and integrating additional features to maximize benefits for its users.

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