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Research paper

Building Children and Adolescents' Electronic Book Reading System: A Conceptual Model

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Abstract
Purpose:Regarding the design of an applicable electronic book reading system for children and adolescents, this study's struggle is to prepare a conceptual model in this case. Method:So we used quantitative approach and Delphi method in order to analyze data. In this regard, criterion based sampling is used to identify the research population. Therefore, 15 experts were identified which had criteria such as having subjective publications, teaching experience, and so on. We factually supposed that these experts could present much more information that we expected to collect. Moreover, 8 electronic book systems were selected to be reviewed, because of their many active audiences, and their international and also standard presence. In fact we firstly identified practical criteria in designing electronic books by extracting them from related resources and also checking active systems. The data helped us to prepare the checklist draft and it was completed after passing validity control step with participation of three experts. Then the checklist was presented to experts in Delphi panel. Finally, consensus on the components was reached after three rounds of Delphi panel. Findings the findings showed that in designing electronic books for children and adolescents, there are five original components. The components include display screen features with 12 criteria, screen organization with 13 criteria, interaction and feedback with 8 criteria, search and retrieval features with 10 criteria, and help and guidance features with 10 criteria. Conclusion:The study, display screen features with score of 3, 706 and interaction and feedback with score

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of 3, 700 were selected as the most important components in designing electronic book systems by Delphi experts. interface children and adolescents library.

Keywords: Building Children, Electronic Book, System, Conceptual Model.

Introduction

In order to foster the habit of reading and to motivate people to read more and more, one must start from childhood. In fact this is the families' responsibility to encourage children and adolescents to read and to get familier with books and other reading facilities. Moreover, after kids start their formal education in the schools, families should have some different activities to help children and youngsters develop the reading habit. Given the vital role of reading in humans' daily life, and the long process of making people accustomed to reading, this issue should be addressed in childhood period (Amani, Azarnavid, 2002).

There is no obvious bounady between traditional and electronic publication. And it can be said that electronic publication produces the three following added values in publication environment: Making content accessible, making connections between contents, making content multimedia (Loebbecke, Powell, 1999). Kids factually have a variety of questions and because of their sense of curiosity and high spirits, need books that encourage them to study more and increase their sense of creativity and intelligence as well as initiative. Moreover audios and videos are always attractive to kids. Therefore, it is expected that electronic books could attract a wide range of users (Fahimifar, Vasfi, 2017). In this regard publishers try to publish electronic books for many reasons. In fact, audience`s need, low producing cost, speedy publishing, and easy distribution are some of publishers' reasons in moving to electronic publishing (Fahimifar, Vasfi, 2017). A research by Livingstore and Bovil (1999) in the case of childrens' interest in reading, showed that children found printed books boring and believe that printed books are obsolete and out of date. In another research children stated that creating online book club where children can share their experiences after using books and rating books can be effective (Hourcade, et al, 2003), Whereas most of digital libraries are not designed for children. For a digital library to appeal to children, they need entertainment, ease of use, and power, both as a reader and as a writer. Therefore, in order to render optimal services to children and adolescents so as to study and increase their reading habits in the electronic environment and also to use it in mobile media such as mobile smartphones, it is necessary to identify appropriate services to render in the electronic space to children and Teenagers. Accordingly, the present study tries to identify the

necessary capabilities in providing children and adolescents with e-books to model the conceptual system of lending and selling e-books to this segment of society. In this regard, the present study could answer the following questions:

1. What are the main elements of an e-book reading system for children and adolescents based on the studied resources?
2. What are the main elements of e-book reading systems for children and adolescents based on active systems in this field?
3. What is the ranking of related elements in e-book reading systems for children and adolescents?
4. What is the conceptual model of e-book reading system for children and adolescents and to what extent is it valid?

Literature review

According to the searches on the researches done in this field, a total of 31 researches were identified. According to the axes of research, they can be divided into three groups:

Table 1. Researches related to review of user interface in digital libraries

No	Year	Researcher	No	Year	Researcher
1	2005	Large, Beheshti	9	2013	Hasanzadeh, Sohrabzadeh
2	2006	Ramayah	10	2014	Xie, Matusiak
3	2007	Bilal, Bachir	11	2014	Tababtabaeipour
4	2007	Mohajer	12	2015	Norouzi, Motazaheri
5	2008	Jana, Das	13	2016	Hosseini
6	2009	Zucker, Moody, McKenna	14	2017	Beiranvand, Khasseh
7	2011	Pashotanizadeh	15	2018	Pistoljevic, Hulusic
8	2013	Chau, Wong, Wang, Lai, Chan, Li, Chu, Chan, Sung	16	2019	Mohammadi

The mentioned researches in the table 1 are all paied to user interface in digital libraries. Large, Beheshti (2005) tried to present guidances for designing user interface for childrens' portal; Ramayah (2006) tried to study user interface for simply applying digital libraries; Bilal, Bachir (2007) studied interaction of Arab chiderens, as a different cultural group of people, with international childerens digital library (ICDL); Mohajer (2007) studied needed specifications for creating international library for children and adolescents; Jana, Das (2008) in

a research analyzed ICDL; Zucker, Moody, and McKenna (2009) surveyed the effects of e-books on childrens; Pashotanizadeh (2011) in her research presented structural important specifications for teenagers website; Chau, Wong, Wang, Lai, Chan, Li, Chu, Chan, and Sung (2013) studied the effect of interactive design on students' learning; Hasanzadeh, Sohrabzadeh (2013) examines the perception of Iranian children aged 7 to 14 years old about the user interface of the National Library website; Xie, Matusiak (2014) in their research identified and evaluated the user interface of digital libraries from the perspective of experts; Tababtabaeipour (2014) in her research studied structure and content of Iranian national childrens' digital library; Norouzi, Motazaheri (2015) in their research assessed user interface of selected national digital libraries and presented proposed criteria; Hosseini (2016) in her research evaluated and validated the user interface elements of Persian children's digital libraries; Beiranvand, Khasseh (2017) analyzed the content and structure of Payame Noor University digital library and compares it with comprehensive libraries; Pistoljevic, Hulusic (2018) in their research had studied the effect of educational e-books on children; Mohammadi (2019) tried to identify needs of Iranian childeren and teenagers in order to suitable use of ICDL.

Table 2. Researches related to Comparison of printed and electronic books from the perspective of experts and users

No	Year	Researcher	No	Year	Researcher
1	2007	Grimshaw, Dungworth, McKnight, Morris	9	2013	Segal-Drori, Kortal, Kien
2	2009	Fahimifar, Gaebi	10	2013	Beiranvand
3	2010	Maynard	11	2014	Ahmadi
4	2010	Naderi, Kharaji	12	2018	Alipour-Hafezi
5	2012	Jeong	13	2018	Fahimifar, Hosseini, Noroozi Chakoli

The researches presented in the table 2 are mostly researches that paied attention to compare printed and electronic book from perspective of experts. Grimshaw, Dungworth, McKnight, Morris (2007) in their study tried to survey children's perception and pleasure from using a media; Fahimifar, Gaebi (2009) in their study evaluated electronic books in the eyes of experts; Naderi, Kharaji (2010) in their research studied undergraduate students' behaviour in the digital

environment; Jeong (2012) studied effects of electronic and printed books on children's perception; Segal-Drori, Kortal, Kien (2013) resulted that electronic books has much more impact on children in low level of economic or social place; Beiranvand (2013) also studied Fars provin's librarians' point of view about electronic books; Moreover Ahmadi (2014) studied information behaviour of children and teenagers in confronting with electronic books; Fahimifar, Hosseini, Noroozi Chakoli (2018) studied librarians and users mind map in electronic publishing; and finally Alipour-Hafezi (2018) studied publishers view points about lending electronic books in digital libraries.

The third category of literature includes researches survey electronic publishing and viewpoint of stakeholders; existing chalenges in this case and proposing solutions. In this category there are researches such as Ramezani, et al. (2019); Arabgar and Sadeghi (2017) and Alipour-Hafezi (2018).

It should be noted that the research of Gaebi and Fahimifar (2011), which is characterized by learning through e-books from the perspective of experts and research of Majzoob and Abo (2010), which aims to gain practical experience and use books and reading for kindergarten children, indicates that the study should be conducted in a specific framework that does not fit into the three above mentioned groups.

In general, it can be acknowledged that the present study has similarities with each of the two above mentioned categories of research, but is more similar to the first group. In none of the mentioned researches, the Delphi method has been surveyed by experts in this field and a model based on the main needs for designing e-book reading systems for children and adolescents has not been proposed, and in this regard, the present study is innovative.

Methodology

Content analyzing method and Delphi method with quantitative method are used in this study. In fact, interview and checklist were used to identify design components of kids' electronic book systems. Afterward according to the two mentioned steps, we identified design components of children and adolescents electronic book system. Then in order to evaluate validity of identified components, a questionnaire was formulated and experts answered the questions.

Research population of this study included 8 systems that prepare electronic book reading services for children and adolescents and also 15 experts in children and adolescents' electronic book reading services domain. In the present study, the texts in the field of information retrieval behavior of children and adolescents and the systems of providing electronic reading services for children and adolescents were studied. Moreover, collaboration of specialists in the field was used as Delphi panel members to evaluate the extracted data. In fact, possible sampling method was used to select specialists for Delphi panel. Criteria such as publishing related papers, teaching experience and so on were used to identify specialists. In the case of identifying e-book reading systems, researchers tried to rank them by the amount of their active users and having a suitable place at an international level.

Resources that survey user interface of children and adolescents' electronic libraries were studied in the first point of content analyzing section of the study. In this regard firstly components of e-book reading system were extracted from resources in the field of e-book and digital library. Moreover, active internationaly well known e-book systems for children and adolescents were studied so as to extract related components of reading e-books. List of the studied systems are as follow:

- International Childeren Digital Library (ICDL)
- Tebyan children' s virtual land library
- Iranian National Children and adolscents library
- Children's Island Library
- Ketabak library
- Koodakaneh
- Institute for the Intellectual Development of Child and Adolescent
- Koodak 24

Afterward a checklist was built by the extracted components in the two pre mentioned steps of this study. The questions in the checklist were in 5-point Likert scale. The Delphi panel was run in three rounds. In fact Kendall coefficient was applied in order to consolidate the experts' opinions. Then a new version of the questionnaire with Kendall coefficient results was returned to the Delphi members. In this section some questions were highlighted that were known to be

insignificant by the experts. Finally the third round of the Delphi panel was accomplished as the previous ones. In fact, in this round an agreement was reached between the members and there were no dramatic changes in the questions. Therefore the Delphi rounds were finished. Then, from the analysis of the obtained results, the importance and rank of each component was determined and the conceptual model of e-book system design was extracted.

Considering the use of the checklist and receiving experts' point of view, and also that the produced checklist is used only in this research, its face and content validity was obtained and there was no need to measure the reliability of the research tool. Factually, Kendal coefficient was used to analyze Likert spectrum in order to determine the degree of coordination between opinions and the validity of the experts' viewpoint.

Results

In this study, by examining texts and information sources as well as active systems, 5 main criteria were identified, which include screen appearance features, screen organization, interaction and feedback, search and retrieval, help and guidance, each of which includes sub-components. After preparing a checklist of these criteria and components, it was given to experts to determine the ranking, conceptual model and validity of this model. It should be noted that the two components of the possibility of choosing a storyteller by the child and the possibility of using the child's name instead of the character of the story, were added to the components by the research team. In the following, the research findings are presented separately and in the order of the basic research questions.

Question 1: What are the main elements of the e-book reading system for children and adolescents based on the studied texts?

The 5 main criteria which were identified in this study include: screen appearance features, possibility of interaction and feedback, search and retrieval facilities, help and guidance facilities, organization of the page content obtained from reading the texts, including components as described in Table 3.

Table 3. Components of e-book reading system derived from reading texts

1-1 Criteria	1-2 Components	1-3 Resource
1-4 screen appearance features	1-5 Use cheerful and bright colors	1-6 Hasanzadeh, Sohrabzadeh (2013)
	1-7 Fit the design of the background color page	1-8 Hasanzadeh, Sohrabzadeh (2013)
	1-9 Show all content on the screen (no need to scroll the page)	1-10 Norouzi (2011)
	1-11 Ability to change fonts (color, size, etc.) to display text	1-12 Hasanzadeh, Sohrabzadeh (2013)
1-13 organization of the page content	1-14 Provide messages and other useful content in recommended places to which the eye is accustomed (such as search information at the top of the page)	1-15 Mohajeri, Salehi (2010); Sedigi, Gilvari, Nooshinfard (2011)
	1-16 Thematic classification of links	1-17 Hasanzadeh, Sohrabzadeh (2013)
	1-18 Book classification by book type (thematic classification)	1-19 Hasanzadeh, Sohrabzadeh (2013); Norouzi (2011)
	1-20 Insert title for each page	1-21 Hasanzadeh, Sohrabzadeh (2013)
	1-22 Classification by cover color	1-23 Hasanzadeh, Sohrabzadeh (2013)
	1-24 The same menus on all pages	1-25 Hosseini (2016)
	1-26 Use of visual symbols along with written symbols	1-27 Hasanzadeh, Sohrabzadeh (2013)
	1-28 Simplicity of symbols	1-29 Sedigi, Gilvari, Nooshinfard (2011)
	1-30 Use the visual symbol with audio	1-31 Hasanzadeh, Sohrabzadeh (2013)

1-32 possibility of interaction and feedback	1-33 Ability to interact and talk between children (in a controlled manner) through the voice chat room	1-34 Sedigi, Gilvari, Nooshinfard (2011)
	1-35 Ability to interact and talk between children (in a controlled manner) through a text chat room	1-36 Sedigi, Gilvari, Nooshinfard (2011)
	1-37 Ability to interact and talk between children (in a controlled way) through the video chat room	1-38 Sedigi, Gilvari, Nooshinfard (2011)
1-39 search and retrieval facilities	1-40 Use of understandable symbols by users	1-41 Hosseini (2016)
	1-42 Show search results as visual symbols with text	1-43 Mohajeri, Salehi (2010)
	1-44 Ability to search results	1-45 Mohajeri, Salehi (2010)
	1-46 Use simple language in the design of the search system to help children	1-47 Hasanzadeh, Sohrabzadeh (2013)
	1-48 Search by selecting image symbols	1-49 Hasanzadeh, Sohrabzadeh (2013)
	1-50 Suggest keywords in the search box when typing	1-51 Hosseini (2016)
	1-52 Ability to save, print or send search results	1-53 Hasanzadeh, Sohrabzadeh (2013)
1-54 help and guidance facilities	1-55 Existanse of video help and guide on each page	1-56 Hasanzadeh, Sohrabzadeh (2013)
	1-57 Existanse of ask a librarian in audio form	1-58 Kokabi, Zeraatkar (2011)
	1-59 Existanse of ask a librarian in video form	1-60 Hasanzadeh, Sohrabzadeh (2013); Pashtoonizadeh (2011)
	1-61 Use simple words in error messages	1-62 Mohajeri, Salehi (2010)
	1-63 Appropriate error message tone	1-64 Hasanzadeh, Sohrabzadeh (2013)
	1-65 Links to front and back	1-66 Norouzi (2011)

	pages	
	1-67 System messages (such as error messages) are associated with signs such as sound, color, or magnification	1-68 Hasanzadeh, Sohrabzadeh (2013)

Question 2: What are the main elements of the e-book reading system for children and adolescents based on active systems in this field?

Results of studying the e-book reading system for children and adolescents are presented in table 4.

Table 4. Components in e-book systems

1-69 **Criteria**	1-70 **Components**	1-71 **Resource**
1-72 screen appearance features	1-73 Use a logo for keys (such as the home icon, which means home screen)	1-74 Koodakaneh, Iranian National Children and adolscents library, Institute for the Intellectual Development of Child and Adolescent, ICDL
	1-75 Use creative images	1-76 Children's Island Library, 1-77 Koodakaneh
	1-78 Use cartoon images	1-79 Iranian National Children and adolscents library, Tebyan, Children's Island Library
	1-80 Use animation	1-81 Koodakaneh, Tebyan, Koodak 24
	1-82 Flexibility in changing the display screen by the user according to the age group (such as changing the page color, font size, etc.)	1-83 Institute for the Intellectual Development of Child and Adolescent, ICDL, Koodakaneh
	1-84 Fit the symbol or menu with the function	1-85 Ketabak, Koodakaneh, Institute for the Intellectual Development of Child and Adolescent, Tebyan, ICDL
	1-86 Rely on visual design (using bookmarks or icons) instead of text	1-87 Iranian National Children and adolscents library, Tebyan, Koodak 24
	1-88 Appropriate font size for	1-89 ICDL

1-69 **Criteria**	1-70 **Components**	1-71 **Resource**
	easy reading of the text	
1-90 Organization of the page content	1-91 Provide a list of suitable readings for each age group	1-92 Ketabak, Institute for the Intellectual Development of Child and Adolescent, ICDL
	1-93 Low use of text on pages	1-94 Koodakaneh, Iranian National Children and adolscents library, ICDL
	1-95 Sort by book size	1-96 ICDL
	1-97 Categorization based on user age	1-98 Ketabak, Koodakaneh, Children's Island Library, Iranian National Children and adolscents library, ICDL
	1-99 Categorization based on the character of the story	1-100 Ketabak, ICDL
	1-101 Distinguish symbols from each other	1-102 Koodakaneh, Iranian National Children and adolscents library
	1-103 Ability to save, view and remind user-favorite pages such as favorites folder	1-104 Children's Island Library, Institute for the Intellectual Development of Child and Adolescent, ICDL
	1-105 Ease of communication of the child with the symbols	1-106 Koodakaneh, Iranian National Children and adolscents library, Tebyan
1-107 Possibility of interaction and feedback	1-108 Ability to contact and submit comments and suggestions by phone, SMS or e-mail to the site administrator	1-109 Ketabak, Children's Island Library, Tebyan, ICDL
	1-110 Express feelings from reading each book by drawing a picture	1-111 Koodakaneh, ICDL
	1-112 Ability to share information produced (stories, poems, etc.) by children	1-113 Koodakaneh, Iranian National Children and adolscents library, Koodak 24
1-114 Search and retrieval facilities	1-115 Provide easy search	1-116 Koodakaneh, ICDL
	1-117 Provide access to resources (such as browsing by content type, selected festival books, cover color, authors and illustrators, continents, countries, personalities, history, etc.)	1-118 Ketabak, Iranian National Children and adolscents library, ICDL
	1-119 Ability to link from	1-120 Children's Island

1-69 **Criteria**	1-70 **Components**	1-71 **Resource**
	search results to related information in the library	Library, Iranian National Children and adolscents library, Institute for the Intellectual Development of Child and Adolescent
	1-121 Select the order in which the child relates the results (using the symbol)	1-122 ICDL
	1-123 Existance of options for selecting a specific language	1-124 ICDL, Institute for the Intellectual Development of Child and Adolescent
1-125 Help and guidance facilities	1-126 Existance of guide to help different levels of age for easily enter and exit of guide	1-127 Ketabak, Children's Island Library, ICDL, Koodak 24
	1-128 Auxiliary information about terms of use	1-129 Ketabak, Children's Island Library, ICDL
	1-130 Links to other digital libraries for kids	1-131 Ketabak, Tebyan, Children's Island Library, Iranian National Children and adolscents library, Institute for the Intellectual Development of Child and Adolescent
	1-132 Links to related books within the system	1-133 Ketabak, Tebyan, ICDL
	1-134 Possibility to continue working after using the help system (possibility to return to the previous page)	1-135 Ketabak, Koodakaneh, Tebyan, Koodak 24

Question 3: What is the ranking of related elements in e-book reading systems for children and adolescents?

To answer this question, the checklist prepared in the form of Likert spectrum and in the Delphi panel was given to the experts. The result of the final round of the Delphi panel is described in Table 5. It should be noted that in the third round, panel members reiterated their views on each of its components and items, so the Kendall coordination coefficient increased significantly to 0.155. Since the value of the coordination coefficient in the third round increased only by 0.08, compared to the second round, and considering that the amount of consensus of the members in the two rounds does not show significant growth, so we stopped repeating the Delphi rounds.

Table 5. Results from Delphi panel

Criteria	Components	Score 1	Score 2	Score 3	SD
Screen appearance features	Use cheerful and bright colors	3.87	3.93	3.73	1.486
	Fit the whole page design with the background color	4.13	4.60	3.67	1.047
	Show full screen content (no need to scroll the page)	3.60	3.20	3.40	1.502
	Use logo for operational keys	3.87	4.07	3.53	1.125
	Use creative images	3.80	4.07	3.87	1.125
	Use cartoon images	3.20	2.87	3.47	1.125
	Use animation	4.13	3.27	4.33	1.175
	Ability to change fonts (color, size, etc.) for text display	4.13	3.20	3.33	1.633
	Flexibility in changing the screen by the user according to the age group	4.20	4.00	3.40	1.549
	Fit the symbol or menu with the function	4.13	3.80	3.27	1.580
	Rely on visual design (using bookmarks or icons) instead of text	3.87	4.07	4.00	1.309
	Appropriate font size for easy reading of the text	3.80	3.93	4.47	0.915
Organization of the page content	Deliver messages in recommended locations to which the eye is accustomed	3.27	2.53	3.00	1.464
	Provide a list of suitable readings for each age group	3.40	3.73	3.93	0.884
	Thematic classification of links	3.53	4.07	4.27	1.387
	Book classification by book type (thematic classification)	3.60	3.20	3.60	1.298
	Insert title for each page	2.73	3.47	3.27	1.387
	Low use of text on pages	4.27	3.13	4.00	1.000
	Classification by book size	2.93	2.60	3.00	1.134
	Classification based on user age	3.27	3.67	2.67	1.113
	Classification by cover color	2.67	2.73	2.87	1.187
	Classification based on the character of the story	2.33	3.40	2.93	1.624
	The same menus on all pages	3.27	2.67	3.00	1.134
	Use of visual symbols along with written symbols	3.20	2.93	2.27	1.280
	Simplicity of symbols	3.47	3.93	3.47	1.302
	Distinguish symbols from each other	3.47	3.87	4.07	1.280
	Ease of communication of the child with the symbols	4.20	3.87	3.80	1.014
	Use the visual symbol with audio	3.87	4.27	3.93	1.438
	Ability to save, view and remind the user's favorite pages	3.93	3.60	4.33	0.724

Criteria	Components	Score 1	Score 2	Score 3	SD
Possibility of interaction and feedback	Express your feelings from reading each book by drawing a picture	3.27	3.40	3.53	0.990
	Ability to interact and talk between children through the voice chat room	3.47	3.13	3.47	1.246
	Ability to interact and talk between children through the text chat room	3.13	3.20	3.27	1.163
	Ability to interact and talk between children through the video chat room	3.07	3.27	3.40	1.298
	Ability to contact and provide comments and suggestions to the site administrator	3.20	3.80	3.13	1.246
	Ability to choose a storyteller by the child (in the case of an audiobook)	4.20	4.07	4.67	0.488
	Ability to use the child's name instead of the characters in the story	3.33	4.27	4.13	1.356
	Ability to share information generated by children	3.60	3.93	4.00	1.134
Search and retrieval facilities	Provide easy search	3.47	4.13	3.67	1.175
	Use of understandable symbols by users	4.13	3.47	3.73	1.387
	Show search results as visual symbols with text	3.40	4.33	4.13	0.834
	Enable resource browsing	3.53	3.80	3.80	1.207
	Ability to link from search results to related information in the library	3.53	3.47	3.93	1.280
	Ability to search in results	3.67	3.53	4.13	1.187
	Use simple language in the design of the search system to help children	3.67	3.60	4.13	0.743
	Search by selecting image symbols	3.33	3.67	4.00	0.926
	Suggest keywords in the search box when typing	3.93	3.67	3.73	1.438
	Select the order in which the child relates the results (using the symbol)	3.00	3.27	2.93	1.163
	Ability to save, print or send search results	3.27	3.40	2.60	1.056
	Existence of options for selecting a specific language	3.60	2.87	3.33	1.291
Help and guidance facilities	Existance of video help and guide on each page	3.33	3.87	4.00	0.845
	Existence of a guide to help different levels of age enter and exit the guide easily	2.60	3.33	3.40	1.404
	Auxiliary information about terms of use	3.80	3.67	3.60	1.404
	Ask the librarian for an option by voice	3.80	3.13	3.67	1.234
	Ask the librarian for a video option	3.13	3.67	2.80	1.014
	Use simple words in error messages	4.33	3.33	3.87	1.187

Criteria	Components	Score 1	Score 2	Score 3	SD
	Appropriate error message tone	3.33	3.07	3.27	1.280
	Links to other digital libraries for kids	3.80	3.93	4.00	0.756
	Links to front and back pages	3.47	2.80	2.87	1.246
	Links to related books within the system	3.47	3.20	3.00	1.254
	Possibility to continue working after using the help system (possibility to return to the previous page)	3.60	4.07	3.93	1.100
	System messages are accompanied by symbols such as sound, color or magnification	4.13	4.07	3.53	1.642

Then, in order to prioritize the criteria and components, the Kendall coefficient test was performed and the following results were obtained (Table 6).

Table 6. Results of the third round of prioritization[1]

Rank No	Criteria	Score
1	Ability to choose a storyteller by the child (in the case of an audiobook)	4.67
2	Appropriate font size for comfortable text reading	4.47
3	Use animation	4.33
4	Ability to save, view and remind the user's favorite pages	4.33
5	Thematic classification of links	4.27
6	Ability to use the child's name instead of the characters in the story	4.13
7	Show search results as visual symbols with text	4.13
8	Ability to search results	4.13
9	Use simple language in the design of the search system to help children	4.13
10	Distinguish symbols from each other	4.07
11	Rely on visual design (using bookmarks or icons) instead of text	4
12	Low use of text on pages	4
13	Ability to share information generated by children	4
14	Search by selecting image symbols	4
15	Existance of video help and guide on each page	4
16	Links to other digital libraries for kids	4
17	Provide a list of suitable readings for each age group	3.93
18	Use the visual symbol with audio	3.93
19	Ability to link from search results to related information in the	3.93

1 In this round, components with a score below 3 were removed from the ranking.

Rank No	Criteria	Score
	library	
20	Possibility to continue working after using the help system (possibility to return to the previous page)	3.93
21	Use creative images	3.87
22	Use simple words in error messages	3.87
23	Ease of communication of the child with the symbols	3.8
24	Enable resource browsing	3.8
25	Use cheerful and bright colors	3.73
26	Use of symbols understood by users	3.73
27	Suggest keywords in the search box when typing	3.73
28	Fit the whole page design with the background color	3.67
29	Provide easy search	3.67
30	Ask the librarian for an option by voice	3.67
31	Book classification by book type (thematic classification)	3.6
32	Auxiliary information about terms of use	3.6
33	Use logo for operational keys	3.53
34	Express your feelings from reading each book by drawing a picture	3.53
35	Accompanying system messages with signals such as sound, color, or magnification	3.53
36	Use cartoon images	3.47
37	Simplicity of symbols	3.47
38	Ability to interact between children through the voice chat room	3.47
39	Show all content on screen (no need to scroll the page)	3.4
40	Flexibility in changing the screen by the user according to the age group	3.4
41	Ability to interact between children through the video chat room	3.4
42	There is a guide to help different levels of age enter and exit the guide easily	3.4
43	Ability to change fonts (color, size, etc.) for text display	3.33
44	Existence of options for selecting a specific language	3.33
45	Fit the symbol or menu with the function	3.27
46	Insert title for each page	3.27
47	Ability to interact between children through a text chat room	3.27
48	Appropriate error message tone	3.27
49	Ability to contact and provide comments and suggestions to the site administrator	3.13
50	Deliver messages in recommended locations to which the eye is accustomed	3
51	Classification by book size	3
52	The same menues on all pages	3
53	Links to related books within the system	3
54	Classification based on the character of the story	2.93

Rank No	Criteria	Score
55	Select the order in which the child relates the results (using the symbol)	2.93
56	Classification by cover color	2.87
57	Links to front and back pages	2.87
58	Existence of ask a librarian as a video	2.8
59	Classification based on user age	2.67
60	Ability to save, print or send search results	2.6
61	Use of visual symbols along with written symbols	2.27

At the end of the Delphi stages, in order to identify the scores, the factors that in the third round of Delphi have a score above 3 are important , according to Table 7, in their group. Finally 53 components were identified with a score above 3, of which 12 factors related to the category of screen features, 13 factors related to organizing the content of the screen, 8 factors related to the possibility of interaction and feedback, 10 factors related to search and retrieval facilities, and finally 10 indicators related to help and guidance facilities.

Table 7. Final ranking of suitable factors for providing services based on a high score of 3

No	Criteria	Score	SD
1	**Screen appearance features**	**3.706**	**0.422**
1-1	Appropriate font size for easy reading of the text	4.47	0.915
1-2	Use animation	4.33	1.175
1-3	Rely on visual design (using bookmarks or icons) instead of text	4	1.309
1-4	Use creative images	3.87	1.125
1-5	Use cheerful and bright colors	3.73	1.486
1-6	Fit the whole page design with the background color	3.67	1.047
1-7	Use logo for operational keys	3.53	1.125
1-8	Use cartoon images	3.47	1.125
1-9	Show full screen content (no need to scroll the page)	3.4	1.502
1-10	Flexibility in changing the screen by the user according to the age group	3.4	1.549
1-11	Ability to change fonts (color, size, etc.) for text display	3.33	1.633
1-12	Fit the symbol or menu with the function	3.27	1.58
2	**Possibility of interaction and feedback**	**3.700**	**0.502**

No	Criteria	Score	SD
2-1	Ability to choose a storyteller by the child (in the case of an audiobook)	4.67	0.488
2-2	Ability to use the child's name instead of the characters in the story	4.13	1.356
2-3	Ability to share information generated by children	4	1.134
2-4	Express your feelings from reading each book by drawing a picture	3.53	0.99
2-5	Ability to interact and talk between children through the voice chat room	3.47	1.246
2-6	Ability to interact and talk between children through the text chat room	3.4	1.298
2-7	Ability to interact and talk between children through the video chat room	3.27	1.163
2-8	Ability to contact and provide comments and suggestions to the site administrator	3.13	1.246
3	**Search and retrieval facilities**	**3.678**	**0.353**
3-1	Show search results as visual symbols with text	4.13	0.834
3-2	Ability to search in results	4.13	1.187
3-3	Use simple language in the design of the search system to help children	4.13	0.743
3-4	Search by selecting image symbols	4	0.926
3-5	Ability to link from search results to related information in the library	3.93	1.28
3-6	Enable resource browsing	3.8	1.207
3-7	Use of understandable symbols by users	3.73	1.387
3-8	Suggest keywords in the search box when typing	3.73	1.438
3-9	Provide easy search	3.67	1.175
3-10	Existence of options for selecting a specific language	3.33	1.291
4	**Help and guidance facilities**	**3.494**	**0.373**
4-1	Existence of video help and guide on each page	4	0.845
4-2	Links to other digital libraries for kids	4	0.756
4-3	Possibility to continue working after using the help system (possibility to return to the previous page)	3.93	1.1
4-4	Use simple words in wrong messages	3.87	1.187
4-5	Ask the librarian for an option by voice	3.67	1.234
4-6	Auxiliary information about terms of use	3.6	1.404
4-7	System messages are accompanied by symbols such as sound, color or magnification	3.53	1.642
4-8	Existence of a guide to help different levels of age	3.4	1.404
4-9	Appropriate error message tone	3.27	1.28
4-10	Links to related books within the system	3	1.254
5	**Organization of page content**	**3.435**	**0.313**

No	Criteria	Score	SD
5-1	Ability to save, view and remind the user's favorite pages	4.33	0.724
5-2	Thematic classification of links	4.27	1.387
5-3	Distinguish symbols from each other	4.07	1.28
5-4	Low use of text on pages	4	1
5-5	Provide a list of suitable readings for each age group	3.93	0.884
5-6	Use the visual symbol with audio	3.93	1.438
5-7	Ease of communication of the child with the symbols	3.8	1.014
5-8	Book classification by book type (thematic classification)	3.6	1.298
5-9	Simplicity of symbols	3.47	1.302
5-10	Insert title for each page	3.27	1.387
5-11	Deliver messages in recommended locations to which the eye is accustomed	3	1.464
5-12	Classification by book size	3	1.134
5-13	The same menus on all pages	3	1.134

Based on the analysis of the results, criteria such as the appearance of the screen and the possibility of interaction and feedback have the highest score in the Delphi panel. This indicates that from the point of view of experts, these two criteria should be given priority in the design of these systems, because the audience of these systems is children and adolescents. This segment of the audience was initially attracted to the appearance of these systems and if they consider this environment suitable, they use its facilities well. Another criterion is the possibility of interaction and feedback, because children and adolescents seek to discover the world around them and tend to temporarily distance themselves from the family to discover new experiences and share the world as they see it through the lens of their eyes and use the experiences of their peer group.

Table 8. Ranking criteria for providing reading services for kids and adolsents

Criteria	Value
Screen appearance features	3.706
Possibility of interaction and feedback	3.700
Search and retrieval facilities	3.678
Help and guidance facilities	3.494
Organization of page content	3.435

In the table 8, the only main criteria are presented sequentialy by their value

Discusion and conclusion

According to daily development of information technology and interest of children and addolsents in smart tools, designing systems for reading in the new information environment can play a key role. Hence the current library systems do not pay suitable attention to the kids and adolsents behavior and needs, it was more important to do a study in this domain. The current study tried to identify main criteria and their sub-components so as to propose suitable ones to be used in the new library systems for kids and adolsents.

After ranking the identified criteria and components, the conceptual model of designing the e-book study system for children and adolescents was designed. The model consists of 12 components related to the screen appearance features, 8 components related to the interaction and feedback criterion, 10 components related to the search and retrieval facilities criterion, and 10 components related to the Help and guidance features, and finally 13 components related to the screen content organization criteria, which are shown in Figure 2.

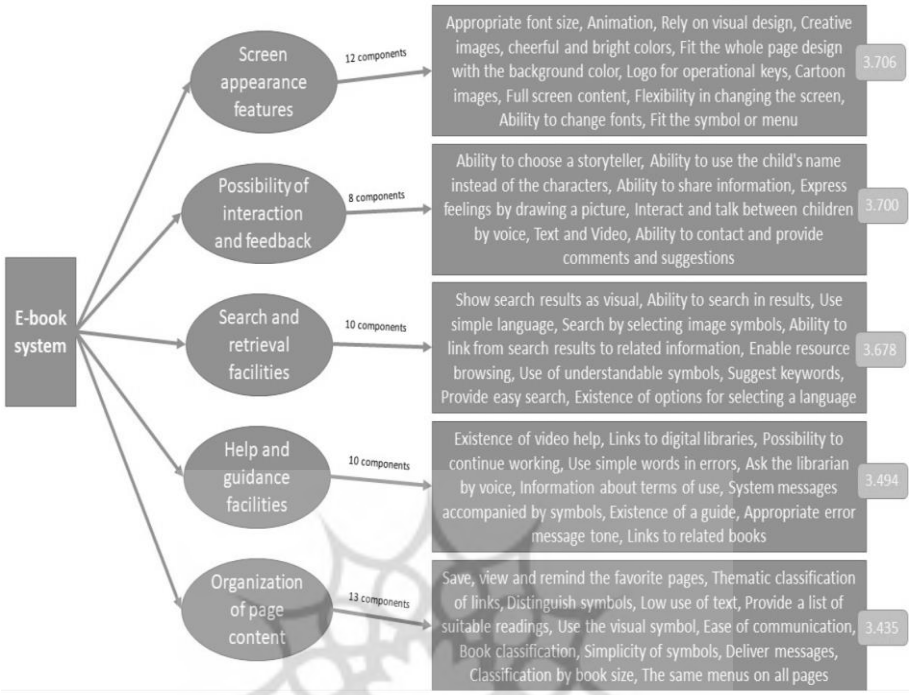

Figure1. Proposed conceptual model of child and adolescent e-book reading system

The proposed conceptual model of e-book study system consists of criteria and components that have been evaluated by experts in this field. In the analysis of opinions, the Kendall coefficient was used which shows that people who have sorted several categories according to their importance, have basically used the same criteria to judge the importance of each category and agree on this point of view. Moreover, Standard Deviation (SD) was used to estimate the dispersion around the average of the data. In fact, the greater the dispersion among experts point of view, the less dispersed the components were selected. Thus we can say that there was a consensus among experts view points. As a result, the conceptual model obtained from the data is sufficiently valid and can be used as a basis for future research in order to build a tool for conducting related research.

In general, in order to have dynamic and efficient e-book reading systems, proper measures must be taken. For this purpose, the main criteria and components of the system related to children and

adolescents should be identified according to the opinions of experts in this field to be used in the design of systems. Among the 5 main criteria, the appearance features of the screen with a score of 3.706, the possibility of interaction and feedback with a score of 3.700, and search and retrieval facilities with a score of 3.678, respectively, have been identified as the main criteria. Also the help and guidance feature (3.494) and the organization of the display content (3.435) have a lower score in experts ` opinions in the design of systems. The scores of these components are not very far from the high components, yet they were ranked lower.

Ramaya (2006) and Large and Beheshti (2005) in their research have provided guidelines for designing the user interface of the children's portal and have examined issues such as visual design, portal name, chat room, multilingual facilities, etc. that are consistent with the present study Because the mentioned cases are among the criteria and components discussed in this research. In another study, Chao et al. (2013) discussed the effects of interactive e-book design on students of language learning, the results of which are consistent with the present study, because in this study, the possibility of interaction and feedback has been identified as an important criterion.

Jana and Das (2008) have analyzed and evaluated the International Library for Children and Adolescents. They have provided criteria for evaluating the library. In fact some of these criteria are general and some are specific to the library interface, content understandability for children, attractive pages, which are consistent with the present study, with the difference that Jana and Das have compared the National Children's Library with these criteria, but in the present study, these criteria have been assessed and evaluated by experts in this field. Ghaebi and Fahimifar (2011) in their research have examined the characteristics of e-book learning from the perspective of Iranian experts, which shows that factors such as high storage capacity and multifaceted ability are the most important features in e-book learning. It is consistent with results of this study, because the multifaceted ability of the e-book is one of the components discussed in this research. Xie and Matusiak (2014) in their research have identified and evaluated the user interface of digital libraries from the perspective of experts, which is consistent with the present study, because the main purpose of this research is to identify the criteria and components required to have an e-book study system.

Zaker Shahrak (2006), in a study entitled "Study of the characteristics of creating an international digital library for children and adolescents in Iran" studied the feasibility and necessity of creating an international digital library for children and adolescents in Iran; Which is consistent with the present study, because the characteristics of creating a library suitable for children and adolescents have been studied. Mohajer (2006) in a study examined information architecture from the perspective of children and adolescents entitled "Evaluation of Persian sites for children and adolescents on the web using content analysis". The results of this study showed that a total of 58% of the criteria for designing web pages for children and adolescents have been observed by the research community; Which is consistent with the present study, because children's websites have been reviewed according to the checklist prepared from important criteria and components. Pashtunizadeh (2010), Tabatabai-Pour (2013), Hosseini (2014), Mohammadi (2016) in their research, all four researches have examined the important features of the websites and the National Library for Children and Adolescents and its optimal use; The results of their research are consistent with the present study and some of their components are similar to the components mentioned in this study. Norouzi, Motazhari (2013) in their research have evaluated the user interface of the world's selected national digital library and proposed appropriate criteria that are consistent with the present study.

Today, designers of e-book reading systems and e-libraries are forced to use the views of computer science experts, children and adolescent literature, as well as librarians, to improve the design of their software. Because these professionals are closely associated with these environments, and like their users, are aware of their needs. Therefore, it is suggested to use the model presented in this study in designing systems related to children and adolescents, which includes criteria and components and prioritization and importance of each of them. It is hoped that children and adolescents will find the future systems more highly efficient and suitable.

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