

Support System for Creating Pathfinder Using Reference Examples

Yasuro Nakao

Morioka University, Faculty of Literature, Japan

Morioka, Japan

E-mail: yas@kyudai.jp

Abstract—A library pathfinder is a guide that gathers basic information resources on a specific subject. However, the library pathfinder is developed using a manual method based on a librarian's experience and present knowledge. Therefore, there is an issue of whether a pathfinder contains suitable resources. In this study, a pathfinder support system has been developed to produce a pathfinder draft using past library reference example data. As a result, it was discovered that the suggestion method developed here could possibly search relevant resources that are not accessible using the Online Public Access Catalog (OPAC) base method.

Keywords—reference service; library pathfinder; reference example; reference tool; Reference Collaborative Database.

I. INTRODUCTION

A library reference service mediates between a user and the information that the user needs. In a conventional library reference service, reference research is conducted after receiving a question from a user, thus making it a passive service.

In contrast, a more active library reference service has been offered in recent years. This service, called transmission-type information service, anticipates users' needs in advance and offers the appropriate information. It has expanded the conventional library reference service.

A. Library Pathfinder

A transmission-type information service includes various services. One of the most characteristic services is a library pathfinder, hereafter referred to as "pathfinder". Pathfinder has been created at the Massachusetts Institute of Technology library in 1969 [1]. Pathfinder is also called an information guide for users. Pathfinders are generally comprised of leaflets.

Pathfinder comprises basic knowledge and selected resources for learners. These resources are restricted to those that the library holds and a user can access. A pathfinder is different from a comprehensive resource list or web link, as it contains the information that summarizes related basic resources and retrieval methods on a specific subject.

However, the standard of the pathfinder does not exist. The style of the pathfinder varies by library type and target user. Libraries devise the form of a pathfinder specifically for the needs of that library. In many libraries, a pathfinder consists of the following elements:

A. Theme

- B. Key word and classification number (NDC: Nippon Decimal Classification)
- C. Explanation on a theme
- D. Basic printed material and network resource
 - * Reference book, secondary resource, database
 - * Related book, magazine, newspaper, audio-visual data, web site etc.

There is also not a fixed procedure for making a pathfinder. The following is the process that is generally used:

1. Plan of a theme
2. The decision of keywords or classification number
3. Making of explanation sentence on the theme
4. Searching the following resources using the keywords etc., and making a candidate list for pathfinder.
 - Books, journals or audio-visual materials etc. are searched using Online Public Access Catalog (OPAC).
 - Articles of journal or newspaper are searched using index database.
 - Reference books or web resource are searched using reference information site such as NDL Research Navi.
5. Checking each resource and creating a fixed pathfinder list.
6. Making of bibliography information on each resource
7. The design and edit work

Some libraries generate and offer a pathfinder dynamically using a database. However, many libraries provide a pathfinder statically. A pathfinder is often created by librarian using Office software like Microsoft Word manually. Resources are selected using the librarian's experience and knowledge as a professional. The problem is judging whether the pathfinder is appropriate for the situation. There might be useful resources that the librarian cannot find on account of manual searching based on librarian's experience and knowledge. This suggestion is to support or to complement that with reference service data.

B. Related Work

Research work on library pathfinders includes the following: Kashima et al. introduced the pathfinder to Japanese libraries and considered the importance of subject analysis when making a pathfinder [2]. Ito et al. surveyed the current situation of pathfinder use in Japan [3]. Sakajiri and Ito et al. introduced information about actual pathfinder

making, maintaining and managing in the National Diet Library [4][5].

Nakashima studied the system of support for a learner making a pathfinder by himself for active learning [6]. Sakai et al. studied the development of the system for users associated with Wikipedia [7]. In this study a support system to generate pathfinder information for librarians was built and its validity was clarified to contribute to pathfinder construction. To our knowledge there are no studies on support for librarians, not for users when they make a pathfinder in Japanese. And we utilize the information of the reference example that was only recorded, more positively to make a pathfinder. This study aims to support the process (2) and (4) in making pathfinder.

II. METHODOLOGY

This study focuses on the use of reference example data to make a pathfinder. Reference examples are information recorded based on past library reference services.

More than one site exhibits reference example data in Japan. Reference example data are available from the Collaborative Reference Database [8] in the National Diet Library, the largest database in Japan. Reference examples are registered with this database by public, school, university, special and national libraries. This database is the de facto standard database in Japan.

A total of 154,127 records were registered as of the end of March 2016. 89,244 records are open to the public. The number of records in the Collaborative Reference Database is increased every year.

The following are the main components of these records.

Question / Answer / Reference materials / Answering process / Preliminary research / Keywords / NDC / Type of search / Type of subject / Category of questioner / Resolved/Unresolved / Access level / Creation date of case data. There are other elements for data management like Registration number, Registration date and Last update, etc.

It is not possible to directly use a reference example as a pathfinder, as each reference example is individual or personal record. However, the elements included in this example can be used to make one. In particular, resources recorded in the categories of “Answer”, “Reference materials”, “Keywords”, and “NDC” are useful for pathfinder creation.

A total of 82,823 examples were used in this research. These records are open to the public, and were acquired as of August 12, 2015 through Collaborative Reference Database API.

All reference tools were extracted from the 82,823 examples. Reference tool is the information resource used in reference search, such as reference books, network database or web site and so on. Reference examples have two types of tool, printed resources and network resources. The fields used for extraction were “Answer” and “Reference materials”. Reference tools also existed in other fields such as “Answering process”. However, there is the possibility

that irrelevant or inaccurate resources may have been included in these fields, as “Answering process” is the search memo before final answering.

Printed resources, such as reference books are often described using the Japanese character *kagi* (square bracket; Japanese-style quotation marks) in reference example sentences (Fig. 1, Fig. 2 is translation of Fig. 1). Printed resources were extracted using *kagi*. Network resources, such as databases or websites were extracted using an associated Uniform Resource Locator (URL).

Printed resources have been grouped with the first *wakachigaki* chunk. *Wakachigaki* is the practice of separating words in Japanese with spaces. For example, "NihonKokugoDaijiten" and "NihonKokugoDaijiten ver.4" are treated as the same group. Network resources were grouped by domain name.



Figure 1. Reference example sentence image. (Japanese)

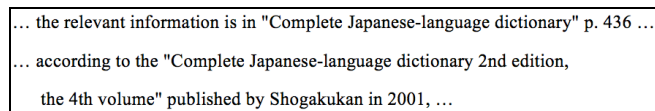


Figure 2. Reference example sentence image (translated into English).

TABLE 1. EXTRACTION DATA.

	Total number	Type number	Number of reference example included (ratio)
Reference tools	246,610	180,826	58,351 (70.5%)
Keywords	195,203	94,259	58,433 (70.6%)
NDC	100,189	848 (section)	59,316 (70.8%)

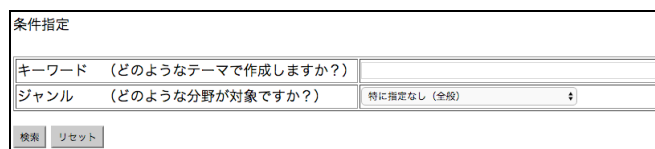


Figure 3. Search screen (Japanese).

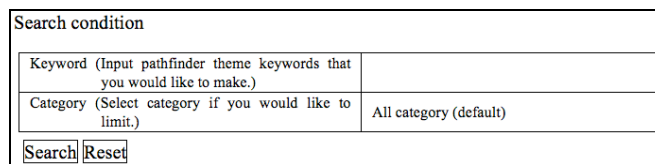


Figure 4. Search screen (translated into English).

パスファインダー「ガーデニングについて調べる」

検索画面キーワード候補： /けしー栽培/オモダカ/オートキャンプ/ガーデニング/ザイフリボク/シナヒイラギ/ジュンベリー/ズッキーニ栽培/ダイヤモンドリー/チャイニーズ・ホーリー/ネリイラギモチ/ヒイラギモドキ/ヒシ/ヒメイワタバコ/ヒメシロアサザ/フィッシング/ペチュニア/ホスピタルアート 病院 アート 芸術/ミズオオバコ/リコリス/レジャー/ローズ/会社/住居/余暇消費実態調査報告/切り戻し/園芸/園芸植物/家庭工作/家庭菜園/折り紙/栽培/植物-目録/水草/浮世絵/瓜/瓜半月/球根/盆栽/睡蓮 (スイレン) /社会生活基本調査/種子/種苗/緑化人口/花ら摘み/花弁/蓮 (ハス) /藝伎/趣味の園芸/農業/野菜-農業/

分類記号 (NDC) 候補： /365/470/471/477/479/494/498/528/592/615/617/620/625/626/627/629/653/721/754/

基礎知識の確認：「ガーデニング」 ([Wikipedia](#)) ([コトバンク](#))

調べツール候補：143 件ヒットしました。

1	「開花順」四季の野の花図鑑：花色で引ける・見分け方がわかる [OPAC確認2] [ツールチェック]	(事例1000115593)	ヒメイワタバコという植物のくわしい生態が…
2	「山野草の名前」1000がよくわかる図鑑 [OPAC確認2] [ツールチェック]	(事例1000115593)	ヒメイワタバコという植物のくわしい生態が…
3	アートマネージメント研究(4) [OPAC確認2] [ツールチェック]	(事例1000029373)	ホスピタルアートについて詳しく書かれて…
4	アンケート調査年鑑 [OPAC確認2] [ツールチェック]	(事例1000053627)	集合住宅居住者の中で占める園芸を行う人の…
5	アンケート調査年鑑99上巻 [OPAC確認2] [ツールチェック]	(事例1000025444)	「オートキャンプ」「ガーデニング」「フィ…
6	オックスフォード植物学辞典 [OPAC確認2] [ツールチェック]	(事例1000115593)	ヒメイワタバコという植物のくわしい生態が…
.....		
42	レジャー白書 [OPAC確認2] [ツールチェック]	(事例1000053627)	集合住宅居住者の中で占める園芸を行う人の…
43	育てる調べる山野草2525種：野の花・山の花・海外種・園芸種まるごと大百科：最新決定版 [OPAC確認2] [ツールチェック]	(事例1000115593)	ヒメイワタバコという植物のくわしい生態が…
44	園芸植物大辞典 [OPAC確認2] [ツールチェック]	(事例1000039824)	① ミズオオバコ ② ヒメシロアサザ の…

Figure 5. Search results (Japanese).

Pathfinder: How to search about gardening.

Keyword candidates: poppy-cultivation / Sagittaria trifolia / auto-camping / gardening / Amelanchier asiatica / cornuta Lindl / Amelanchier canadensis / zucchini-cultivation / diamond lily / Nerine / Ilex cornuta / Chinese holly / Nerine / Ilex aquifolia / Ilex cornuta / Trapa japonica / Conandron ramondioides Small form / Nymphoides coreana / fishing / petunia / hospital art / Otelia alismoides / licorice / leisure / rose / company / residence / leisure / National Consumption-State Survey / cutting back / gardening / garden plant / handicraft / kitchen garden / origami / cultivation / plant-catalog / water plant / ukiyoe / nail / lunula / bulb / bonsai / water lily / Survey on Time Use and Leisure Activities / seed / seed and seedling / tree planting population / flower / deadheading / flowering plant / lotus / rose / horticulture for pleasure / agricultural chemicals / vegetable-agriculture

Classification (NDC) candidates: 365 / 470 / 477 / 479 / 494 / 498 / 528 / 615 / 617 / 620 / 625 / 627 / 629 / 653 / 754

Basic knowledge confirmation about gardening: (Wikipedia) (Kotobank)

Pathfinder candidates: 143 hit

1. Flower and blossom illustrated book in four seasons ordering by bloom [confirm OPAC] [tool check]	(Ref. Example 1000115593) I'm looking for the resources written about "conandron ramondioides small form" in detail.
2. Illustrated book: wild grasses and flowers 1000 [confirm OPAC] [tool check]	(Ref. Example 1000115593) I'm looking for the resources written about "conandron ramondioides small form" in detail.
3. Art management study vol.4 [confirm OPAC] [tool check]	(Ref. Example 1000029373) Do you have the book written about hospital art in detail?
4. Questionnaire survey almanac [confirm OPAC] [tool check]	(Ref. Example 1000053627) I'd like to know the percentage of the person who does gardening in the collective housing resident and its degree of satisfaction.
5. Questionnaire survey almanac, first volume in 1999 [confirm OPAC] [tool check]	(Ref. Example 1000025444) I'm looking for the material that is backed up that autocamping, gardening and fishing is boom.
6. Oxford Dictionary of Plant Science [confirm OPAC] [tool check]	(Ref. Example 1000115593) I'm looking for the resources written about "conandron ramondioides small form" in detail.
.....
42. White Paper on Leisure [confirm OPAC] [tool check]	(Ref. Example 1000053627) I'd like to know the percentage of the person who does gardening in the collective housing resident and its degree of satisfaction.
43. Wild grasses and flowers 2525 for growing and looking up [confirm OPAC] [tool check]	(Ref. Example 1000115593) I'm looking for the resources written about "conandron ramondioides small form" in detail.
44. Garden plant complete encyclopedia [confirm OPAC] [tool check]	(Ref. Example 1000039824) I'd like to know how to get seeds of Otelia alismoides and Nymphoides coreana, and how to bring up them outside.

Figure 6. Search results (translated into English).

Keywords were extracted from Keyword fields. NDCs were extracted from NDC fields. Table 1 shows the total data results. A database and prototype search system was built using the extracted data.

The search screen is Japanese as seen in Fig. 3. Fig. 4 is translation of Fig. 3. After submitting search keyword, candidates of related pathfinder resource, keyword and NDC are generated. It is also possible to limit category if necessary using select menu.

The prototype search system is an exact matching system based on keywords. The target fields for searching in this system are “Question”, “Answer”, “Reference materials” and “Keywords”. When entering multiple keywords separated by space, this system searches records including all keywords (AND search).

The search results screen appears as in Fig. 5. Fig. 6 is translation of Fig. 5. The prototype system offers the following functions.

1) Presentation of information resource candidates for the pathfinder.

The set of the reference examples that include search keywords is extracted and the reference tools included in this set are shown as a search result. Search results are divided into printed material and network resource groups. Tools that begin with Hiragana or Katakana are represented in Japanese syllabary order; those beginning with Chinese characters are represented in Chinese-style reading order; and tools that begin with Roman characters are listed in alphabetical order.

2) Presentation of keyword candidates for the pathfinder.

3) Presentation of NDC candidates for the pathfinder.

Keywords and NDCs included in the search results are aggregated and represented.

4) Presentation of questions the reference tool processed and genres the reference tool covered.

When the link “tool check” in Fig. 5 is clicked, Fig. 7 is showed. Fig. 7 is Tool check results window. Fig. 8 is translation of Fig. 7. Tool check results window represents questions that the reference tool processed and genres that the reference tool covered. It is able to confirm reference tool characteristics, all reference examples that the tool used and the genre coverage of NDC class level and division level.

5) Links to the following outside resources:

- Collaborative Reference Database
- Local library OPAC, NDL-OPAC [9]
- NDL Research Navi [10]
- Dictionary or encyclopedia website

When the link “Ref. Example” in Fig. 5 is clicked, the Collaborative Reference Database record that the resource was used is presented. When the link “confirm OPAC” in Fig. 5 is clicked, local OPAC search result is presented. It is able to confirm the holding information of the printed resource. When the each result link in Fig. 5 is clicked, NDL-OPAC search result is presented in the case of printed resource and NDL Research Navi information is presented in the case of network resource. NDL Research Navi is the reference information portal site in Japan. It is able to confirm the bibliographic information of the printed resource, and to confirm the information of the network resource. Dictionary or encyclopedia website, Wikipedia [11] and Kotobank [12] are also linked to confirm further information about the search term. It is able to gather information seamlessly and effectively.

III. EVALUATION

A library pathfinder is a list of resources selected by the librarian. A pathfinder that includes a wide variety of appropriate resources is useful to users. However it is difficult for even a librarian to pick out the proper resources that the library holds. The prototype system evaluation, therefore, has been performed from the angle of resource discovery. We evaluated how long this system could present the resource that librarian cannot find.

The National Diet Library is exhibiting a pathfinder link between prefectural libraries and government designated city libraries in Japan [13]. First, we investigated the pathfinders exhibited by these libraries and chose 5 themes other than those with specific subjects such as “how to use a database” or subjects limited to the library’s local theme. Next, we compared the resources in the result by searching Morioka University Library OPAC [14] that the author belongs to, with keywords matching those provided by the prototype system. Table 2 shows the result.

ROPAC (KW) is the set of resources in the result by searching OPAC with the search keyword KW. RSYSTEM (KW) is the set of resources that the prototype system brings up in the case of using the search keyword KW. R'SYSTEM (KW) is the set of resources that are included in RSYSTEM (KW) and the library holds. ROPAC (KW) ∩ R'SYSTEM (KW) is the set intersection of ROPAC (KW) and R'SYSTEM (KW). R'SYSTEM (KW) - ROPAC (KW) is the set of resources that are included in R'SYSTEM (KW) and are not included in ROPAC (KW). The number of resources in each set is shown in Table 2 under each set name.

The proposed support system retrieves resources that we cannot find by searching OPAC. These include printed resources that are related to the theme of the intended pathfinder. The proposed system, therefore, has the potential to increase appropriate resources for creating a pathfinder.

IV. CONCLUSION AND FUTURE WORK

A reference example has been recorded to accumulate data present in Japanese libraries. Based on previous research, we can assume that by using reference examples, it is possible to find related resources that are difficult to access using an OPAC-based search. Suggestion system using reference examples can expect to complement candidates of resource for the pathfinder. It is possible to increase the reusability of a reference example.

However, we could not judge how useful resources are included from a librarian at this time on account of lacking enough time. It is future's problem to evaluate that. A test at a public library should be conducted next. In particular, the validity of the constructed pathfinder has to be inspected. It is also necessary to validate the function of checking a reference tool and suggesting keywords or NDCs for the pathfinder.

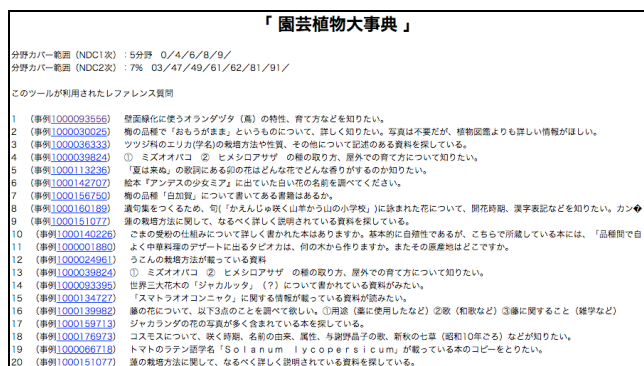


Figure 7. Tool check results (Japanese).

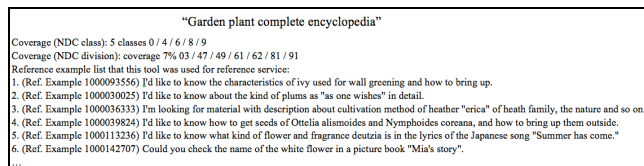


Figure 8. Tool check results (translated into English).

TABLE 2. RESOURCES DISCOVERED USING THE PROTOTYPE.

Pathfinder	<i>KW</i> (Search Keyword)	$R_{OPAC}(KW)$	$R_{SYSTEM}(KW)$	$R'_{SYSTEM}(KW)$	$R_{OPAC}(KW) \cap R'_{SYSTEM}(KW)$	$R'_{SYSTEM}(KW) - R_{OPAC}(KW)$
“How to search about fermented food”	Fermented food	24	115	35	2	33
“How to search about developmental disability”	Developmental disability	208	163	30	20	10
“How to search about influenza”	Influenza	21	99	12	1	11
“How to search about the game of Igo”	The game of Igo	9	98	23	2	21
“How to search about The legends of Tono”	The legends of Tono	51	71	30	2	28

REFERENCES

- [1] P. M Canfield, “Instructional Materials: Design and Development. Library Pathfinders,” Drexel Library Quarterly, vol. 8, pp. 287-300, 1972
- [2] M. Kashima and S. Yamaguchi, “Electronic pathfinders: a window to a new generation library service,” The Journal of Information Science and Technology Association, vol. 52, no. 10, pp. 526–537, 2002. <http://ci.nii.ac.jp/naid/110002826712/> (accessed 2016-07-07)
- [3] M. Ito and K. Ozawa, “A research on the existing condition of online library pathfinders in Japan,” The Journal of Information Science and Technology Association, vol. 58, no. 7, pp. 361-366, 2008. <http://ci.nii.ac.jp/naid/110006793619/> (accessed 2016-07-07)
- [4] K. Sakajiri, “RESEARCH NAVI by the National Diet Library: outline of structuring tasks and contents,” The Library Journal, vol. 106, no.4, pp. 248–251, 2012. <http://ci.nii.ac.jp/naid/40019215521/> (accessed 2016-07-07)
- [5] M. Ito and K. Ozawa, “Reference work: Compiling and providing online pathfinders using reference examples: efforts by business, science and technology division, the National Diet Library to provide subject information, and results,” Reference service and bibliography, vol. 68, pp. 50-68, 2008. <http://ci.nii.ac.jp/naid/40015976209/> (accessed 2016-07-07)
- [6] M. Nakashima, “Creating Web-pathfinders Providing Reliability and Convenience in the Format According to the Information-seeking Behavior Model,” 2011, <https://kaken.nii.ac.jp/en/report/KAKENHI-PROJECT-21500238/RECORD-21500238seika/> (accessed 2016-07-07)
- [7] T. Sakai, H. Masuda, Y. Kiyota and Y. Nakagawa, “An Automated Pathfinder System Using Wikipedia and Library Information Resources,” Proceedings of the Information Processing Society of Japan Annual Convention, vol. 72, pp.65 - 66, 2010. <http://ci.nii.ac.jp/naid/110008139017/> (accessed 2016-07-07)
- [8] <http://crd.ndl.go.jp/reference/> (accessed 2016-07-07)
- [9] <https://ndlopac.ndl.go.jp/> (accessed 2016-07-07)
- [10] <http://rnavi.ndl.go.jp/rnavi/> (accessed 2016-07-07)
- [11] <https://ja.wikipedia.org/> (accessed 2016-07-07)
- [12] <https://kotobank.jp/> (accessed 2016-07-07)
- [13] http://rnavi.ndl.go.jp/research_guide/pubpath.php (accessed 2016-07-07)
- [14] <https://morioka-opac.limedio.ricoh.co.jp/mylimedio/search/search-input.do?mode=comp&nqid=1&lang=en> (accessed 2016-07-07)