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How do library staff view librarian robotics? Librarian staff's ignored humanistic views on the impact and threat of robotics adoption

Wang Zheng
Department of Public Information Resource Management, School of Public Management, Northwest University, Xi'an, China
libranger@outlook.com

Abstract:

Background: The last few years have seen the emerging trends of AI application in various areas. And the intelligent robot is an indispensable part of AI, even as tangible embodiment of AI in social common perception. Robots play potential substitution effect both in knowledge-intensive and labour-intensive fields, including library field.

Library work is the representative one blended with knowledge and labour, so it's also the typical case where robotics apply, or affect. The recent research in library field and popular opinion mainly put the spotlight on technique itself, in addition, some research focus on robot experienced users, with technology optimism tendency.

However, there is a considerable group who is overlooked, whose voice is ignored in a certain extent, that is common "library staff". More importantly, most of them are not directed decision maker of robot adoption, but they are the direct affected ones in library. So it is essential to make library staffs' voice heard.

Purpose: The purpose of this study is to capture the perception from library general staff on robot adoption in library, to identity the stance of librarians who are indispensable stakeholder in AI age, and to form more comprehensive understanding on library robot and AI adoption.

Findings: There are diverse understanding on robotics among library staff. The staff from libraries with different development degree lack consensus on robotics. Adoption of robotics depends on specific working environment. Job insecurity affected by robotics indeed exists in librarian staff, which is relevant with age and employment/engagement form. The reliability and accurateness of robotics are doubted by some librarian.

Originality/value: This study provides a complementary understanding from library staffs' view on robot adoption. Present a more comprehensive look includes various specified stakeholder on AI

adopted in library, and to open a discussion of its potential benefits and threats. Aligning to the existing technical approach, this study complements a humanistic viewpoint.

Keywords: Artificial Intelligence, Library Staff, Librarians, Robotics

Introduction

Discover the gap

The last few years have seen the emerging trends of Artificial Intelligence (AI) applications in various areas. And the robotics is an indispensable part of AI, even as tangible embodiment of AI in social common perception.

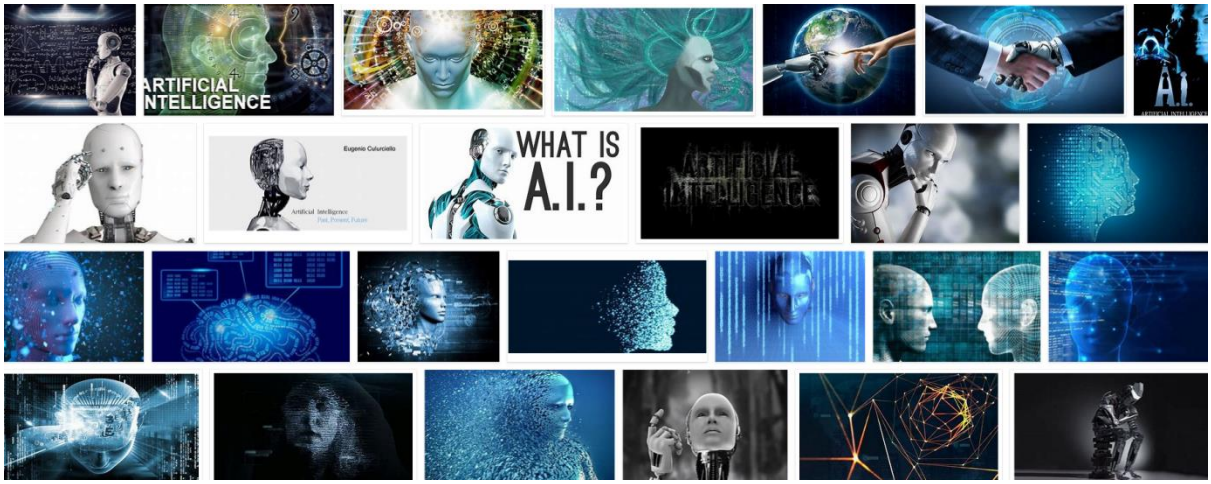

Fig 1 Image Search Results of Googling “Artificial Intelligence”

If we entry “Artificial Intelligence” in Google or Bing image search, we could generally get such image search results as Fig 1. These visualized picture results may not fully comply with kernel and essential conception of AI in technical level, but may partly reflect the social perception of AI subjectively.

These image search results of AI (or regard as the social cognition of AI) have some common feature: they try to “concretization” or “personification” for AI. They make AI application “profile” have body, arms, hands, head and facial features (with neutral facial expression mostly). Regardless this kind of perception origins form profound science fictions or movies such as Terminator, Spielberg’s Artificial Intelligence, either from bionic technology route in actual practice, it reflects some social expectation and assumption on AI for years: to simulate people, or substitute for human beings in a sense, especially in external form and mechanical capabilities. Actually, the above description more suited another term “robotics”, rather than AI.

So there is the first gap between AI practical application and subjective perception we try to identify. We could notice that, sometimes, AI equals robotics in narrow sense, but in some

occasions, discussion on AI exclude the robotics. These two terms were misused occasionally. Table 1 shows some typical definitions about two terms.

Table 1 Typical Definitions about AI and Robot

AI	AI is the science of getting machines, or computer systems, to perform tasks that require intelligence if done by humans, or perhaps animals (Boden, 1978).
	AI is the study of mental faculties through the use of computational models (Charniak and McDermott, 1985)
	AI is the study of ways in which computers can be made to perform cognitive tasks (Rich, 1987).
	AI is concerned with the study and creation of computer systems that exhibit some form of intelligence, learn new concepts and tasks, reason and draw useful conclusions, understand a natural language or perceive and comprehend a visual scene, and perform other types of feats that require human types of intelligence (Patterson, 1990)
	AI are those that can understand and perceive in ways similar to humans (Weckert and McDonald, 1992).
	AI mainly focuses on understanding and performing intelligent tasks such as reasoning, learning new skills and adopting to new situations and problems (Mogali, 2014).
	AI is a cluster of technologies and approaches to computing focused on the ability of computers to make flexible rational decisions in response to unpredictable environmental conditions (Tredinnick, 2017).
	AI is the system that change behaviors without being explicitly programmed based on data collected, usage analysis and other observations (Hare and Andrews, 2017).
Robot	Robot is a mechanical device which performs automation tasks, either according to direct human supervision or a pre-defined program or a set of general guidelines, using artificial intelligence techniques (Wikipedia, 2014).
	Robot is automatically controlled, reprogrammable, multi-purpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in automation applications (Mogali, 2014).
	Robot consist of machine and humanoid, is the machinery to assist or replace human being's task (Shao, 2017).
	Robot is a machine that resembles a living creature in being capable of moving independently (as by walking or rolling on wheels) and performing complex actions (such as grasping and moving objects); or a device that automatically performs complicated, often repetitive tasks (as in an industrial assembly line)(Merriam-Webster, 2018).

From definitions in Table 1 we could figure out the connection and difference between AI and robotics:

(1) Robotics could be the early stage of the AI development. Robotics is the product of previous industrialization wave, its value at the time was to enhance, strengthen or displace

human's physical enginery, and whose function was mainly to imitate people's external behaviors. While AI nowadays focus on simulate human cognitive activities. The distinction also reveals that human society paces from industrial society to knowledge society.

(2) Robotics could be the sub-area of AI (Mogali, 2014). The AI itself is a cluster of technologies and approaches or a "bucket" of developments (Tredinnick, 2017; Cox, 2018). Traditional AI techniques include knowledge representation (rules, frames and semantic networks), logics, inference mechanisms, neural networks, machine learning, pattern recognition, searching and so on (Weckert and McDonald, 1992). Robotics also adopts and fuses these techniques, to upgrade robot "smart" level and interactivity. The increasing number of robots possess "intelligence" more or less benefits from various AI techniques.

(3) However, not every robot could be called AI, which depends on robot just carries out mechanical operation (like traditional manual worker, to a certain extent) especially repetitive tasks or with ability to "to think" and to perform cognitive tasks (like mental worker). So AI achieves far more than robotics. AI is neither a certain device, nor a unitary concept, but is usual to differentiate general or strong AI from narrow or weak AI where applications work on a particular problem space (Cox, 2018).

(4) According to above mentioned differences, AI and robotics have strong tie with computer science and mathematics, but AI is more rely on psychology, philosophy, linguistics and cognitive science, and robotics requires physics and engineering somehow.

(5) As to outward appearance, robots apparently show as mechanical device, to imitate or expand human being's body shape or function (at least part of them), sometimes resembles a living creature in being capable of moving independently, which are easy to perceive. While AI applications sometimes are invisible or imperceptible, for they are running in the background, present by some non-personification interface occasionally.

The fifth point is important, for it led to some interesting results. Sometimes we consider one robot as representative of AI, just because "he" or "she" has human-like body (or farcical gesture, or part of body function), in fact it's not fully conform to AI's qualification, for it unable to think, season, make decision, learn or to self-improve. Meanwhile some genuine AI applications are overlooked by us, or just be viewed as inconspicuous gadget. It is essential to identify this cognition gap, which concerns whether we talk about the right "AI" conception. When we mentioned AI or robotics application, did we refers to genuine object, and did we ignore corresponding potential opportunity or threaten?

For example, when we refers to "AI arrives in the library" (Massis, 2018), we should discern exactly "who" arrives in. In fact, as Cox found, some "AI" had arrived for lone time, some at the gate, and others on the way. And when we refers to hot AI issue "servant or replacer" (Bell, 2016), we also need to identify specific objects, and embrace with the whole picture.

To a certain extent, robot is qualified server for a while, if it was well pre-programed or manipulated, like few people worry calculator or regular motor vehicle become master of mankind. But if we confined our perception of AI in tangible robotics form, or in any other form which perceive easily or imagine subjectively, more opportunities and impacts of AI might be ignored. That is what we called “gap”. In this instance, both optimistic and pessimistic awareness on AI should be reconsidered.

Gap in the library

Now let’s come back at library scene. We distinguish AI applications and robotics at first, because in library both two pattern are heavy- applying, and were misunderstood or confused by library’s patron even librarian themselves. There are a few examples.

Fig 2 “Tu Bao”- Robot in Nanjing University Library Lobby

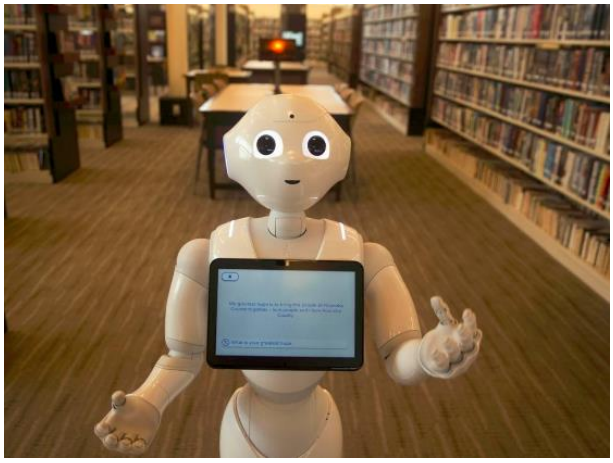

Fig 3 “Pepper”-Community Robot in Roanoke County library

The robots in Fig 2 & Fig 3 fit people’s imagination on AI we have discussed. They are human-like, moving up-right, with eyes and month, resembles a living creature. And they actually are AI applications from basic level. “Tu Bao” is a reception robot in Nanjing University library, its targeted reception is finished by matching the library information consultation and intelligent robot, with the combination of laser sensor for autonomous navigation and library space position located by magnetic navigation. It can speak simple greetings by installing voice system at the same time (Li, 2017). “Pepper” was the first robotic helper introduced in public library system in United States by Roanoke County Public Library, this “humanoid” robot’s current range of abilities includes being able to answer a

roster of “pre-programmed” questions, sharing the story of its own background, telling jokes, and busting out a few dance moves, but it can’t supplant the understanding and responsiveness of a person (Petska, 2019).

According to above description, these robots are pre-programmed, performing routine actions, dealing with specific issues and scene, such as navigating, greeting, answering frequently asked questions and so on. But they have limited learning ability. Unlike Alpha Dog who is self-evolution, these robots in library have same performance as time goes by.

Fig 4 Automated Retrieval Center (ARC) in J.Willard Marriott Library

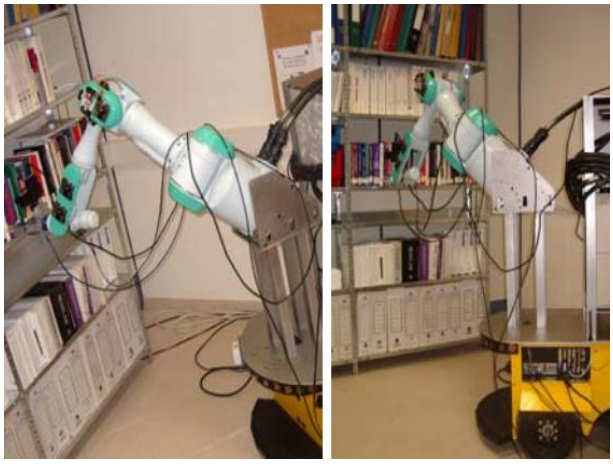

Fig 5 UJI Library Robot to Find and Retrieve Books

Fig 4 & Fig 5 show some familiar mechanical devices in library, they are truly specific-purpose robots. And they actually are AI applications? The Automated Retrieval Center (ARC) is a large storage facility within the library where library materials are stored in order to make space for other services and collections. Machines are used to retrieve and shelve materials stored in the ARC (J.Willard Marriott Library). The librarian robot in Fig 5 was developed by University of Jaume, for the sake to help a library user to find a book and retrieve it from the shelf. The main component of this system includes user-robot interaction, sensor based navigation, book recognition and manipulation planning (Prats, 2004).

Such kind of robots are large-scale used in the library all over the world at present. They repeat the routine actions once human librarian use to perform, rather than break the existing library work flow and rules. They have no decision-making, recommending or other advanced cognitive functions in most cases. And they are more similar to industrial robot in storehouse and factory, with more clear instructions, fixed patterns, stream-lined movements, and less “intelligence”.

Fig 6 Library Chatbot in University of Nebraska-Lincoln

Fig 7 Smart Talking Robot “Xiao Tu” in Tsinghua University

Fig 6 & Fig 7 show another emerging application pattern, namely “robot” officially, or talking robot, chat robot or Chatbot. Chatbot technology has been around for some time, including library now. The Chatbot “Pixel” in Fig 6 was developed by University of Nebraska-Lincoln. It supplies answers to user questions entered in natural language in brief text responses, and provides an interactive experience that mimics a human conversation, while giving immediate answers to questions about library services and resources (Allison, 2012). “Xiao Tu” in Fig 7 is a smart talking robot applying in Tsinghua University library, to provide real-time virtual reference services online for a 24/7 and year-round coverage in the mobile and social networking environments based on AI by using various existing technologies and resources (Yao, 2011). “Xiao Tu” plays the role of a librarian in different locations on different terminals simultaneously and attracts users to participate in the resources collection in an intelligent and highly interactive manner (Yao, 2015).

These so called “robots” are not tangible mechanical device actually, careless with human-shape-like. On the contrary, they put more emphasis on social, local, mobile and virtual features, and pay attention on intelligence level. Such as “Xiao Tu” is equipped with self-learning function. Users can teach “her” to learn new knowledge in an inquiry-answer format, becoming the information co-creators and providers during the interactive communication (Yao, 2015). In this case, the term “robot” is beyond its original intention, more of an analogy. For users, they needn’t meet this kind of setting on-site. In fact, the application provider may hope users be unaware the existence of “robot” but feel communicate with a real human.

To sum up these examples, in library context, sometimes we talk about AI, in fact we refer to robotics and related instruments, which has weak intelligence level, such as some auxiliary mechanical device in library circulation and storage segment; In some other situations, we speak of the word “robot”, actually refer to AI application, such as chat “robot”. Why does this happen in library? And the implications of this gap?

The cause of gap in library

There is a likely explanation. These confused understandings derived from the complexity of library work. Library work is the representative one blended with knowledge-intensive pattern work and labor-intensive pattern work, in other words, blended with mental work (i.e. reference work) and manual work (i.e. printed collection maintain and access). So it provides a larger scale for AI techniques to apply, larger than some other profession or industry, such as medicine, law, manufacture, and warehousing. Fig 8 shows a scope of AI application across industries in general. Every icons is one representatives industry. On the left end of axis, indicate the most knowledge-intensive work, like law and finance on the left, who utilize amount of high-structured explicit knowledge, such as legal provisions, financial terms and policy text. What’s more, these professions face with a large number of decision-making scenes. On the other end of axis, it is labor-intensive work. In the traditional understanding, early agriculture and manufacturing industry lie in right side.

Different segment has its corresponding AI application. Such as farming, processing industry and logistics industry, the traditional labor-intensive work tend to adopt physical robots and related mechanical devices, for example, manipulator arm, sensing technology, Internet of thing, automated guided vehicle and unmanned aerial vehicle. In reality, such industrial robots have already eliminated thousands of workers’ positions by performing their manufacturing jobs (Bell, 2016).

On the other side, the knowledge-intensive work such as law is supposed to be vulnerable area affected by current mainstream AI techniques (Smith, 2016; Chen, 2017). AI application like Case Cruncher Alpha is used today in the practice of law, for example, contract review, billing and jury selection. Besides, in the field of medicine, AI’s ability to crunch massive datasets has allowed it to surpass humans in diagnostic capabilities (Wood & Evans, 2018).

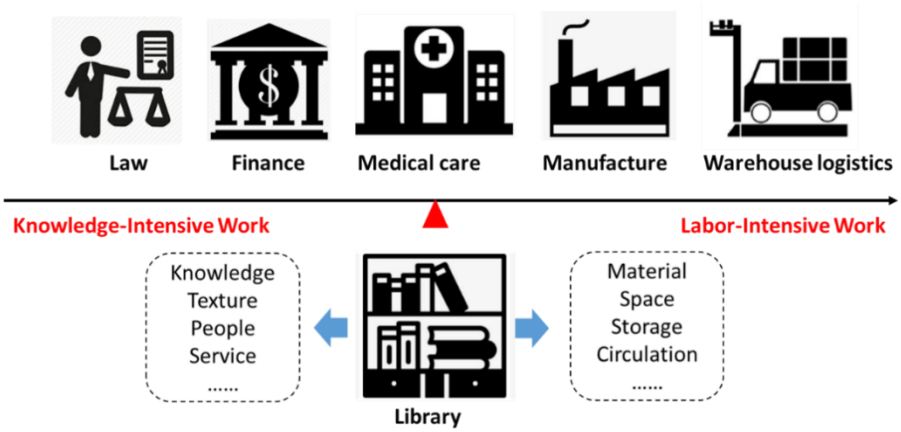

Fig 8 Scope of AI application across industries

Now as to library, the AI application scenarios are more complicated and blended. Library connects with people and resource, based on both physical entity place and online platform. Merely the resource represents different forms, such as print and digital products, audio and video, text and data, structure data and non-structure date. Deal with these elements of library work, need mental work (cope with knowledge, texture, users, service, design etc.) and manual work (cope with material, space, stack, circulation etc.), so library lies in the middle of axis in Fig 8, adopting diversified AI applications. Quite a few research enumerate these various AI techniques in library, like Chatbot, text and data mining (TDM), search, expert system, natural language processing (NLP), pattern recognition, and robotics of course (Weckert and McDonald,1992; Mogali,2014;Fernandez,2016;Cox,2018).

Among them, the second further gap appears: even within library, there were different adoptions and cognitions on AI varies by library sections, depending on intensity of knowledge or labor of librarians' work. Weckert and McDonald (1992) pointed out two strands in AI divided by machines could be programmed or not. These two dimensions, adding with mental & manual work dimensions we discussed above, we could draw the Fig 9 to demonstrate this new gap in AI application and cognition. This division is highlighted in the awareness level by librarian. As mentioned at the beginning, sometimes we were mistaken for robotics as the whole AI connotation, which lead us neglect some high-level AI applications. More significant, we should be aware whether "AI" we once talked about is as the same thing as other ones address or not. For instance, when we keep an optimistic attitude on AI in library, whether to stay on certain level?

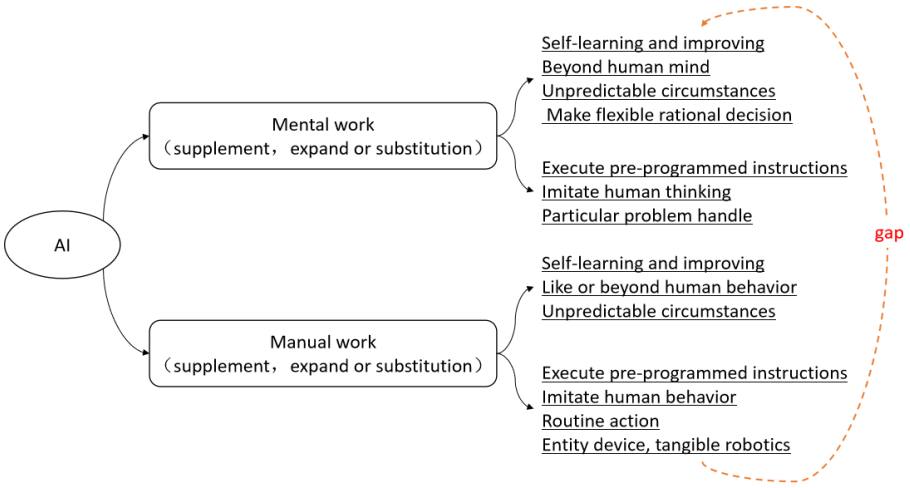

Fig 9 the Gap in Library AI Application and Cognition

In addition, there is the third cognition gap, existing in library practitioner and observer. Some research have noticed the differences of attitudes on AI adoption from diverse groups. According to the 2017 survey of librarians from across all sectors in the USA (Wood & Evans, 2018), respondents saw the AI effect as mostly positive and not likely to involve the replacement of librarians or disintegration of the library, unlike in the professions of law and medicine, the librarians are not overly concerned about occupational attrition or the transformative effects of AI on the field of librarianship. What's more, this survey shows substantial differences between library experts' prognostications and librarians' perception. Such optimism attitude to AI form librarian was in a sharp contrast to widely cited pessimistic studies (Cox, 2018).

Identify the gap

So far, we have addressed three gaps about AI and robotics perception related to library:

(1) Gap 1: separate from AI techniques generator, researcher, operator, user and subjective perceiver. AI is progressing and evolving rapidly, suppose you were in the headstream of AI technique, or in the mainstream or branch of it, you could see different form. Somehow, people tend regard part fragment as the AI whole stream. In brief, the closer to original research end, people are more inclined to see AI as the one try to beyond human being's mental level; the closer to social awareness scope, there are more likely to view AI as the one reach human being's living creature feature and manual level. As Fig 10 shows.

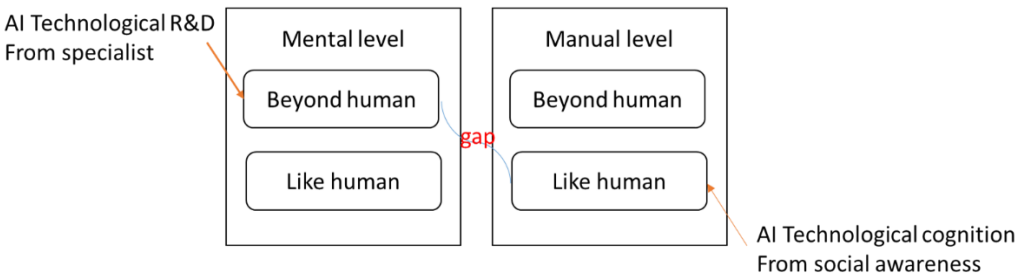

Fig 10 the Gap of Cognitions on AI

(2) Gap 2: separate from different functional sections in library, from knowledge-intensive work to labor-intensive work. Similar to above mentioned gap 1, inside library, also exists various perceptions on AI. The trouble may lie in making an overall judgement of AI and its impact based on one-side pieced opinion.

(3) Gap 3: separate from different groups within library community, from expert, commentator, manager, observer to first-line practitioner. Even within each group, still lacks consensus on AI. The problem may origin from the disparity of influence from different group. Certain group may dominate in AI issue discussion and technique adoption, by their imperfect judgment on AI.

Each gap above mentioned is worth to attention, and as a whole promotes this study. In this study, we try to identify and verify this series of gaps furthermore. As analyzed above, as to issue of "library adopts AI", both "library" and "AI" are concepts covering a wide range, need to be more specific and subdivided, particularly refer to "which section of library" and "which group of library community" adopt "what specific sub-technique of AI". In this context, we purposely chose specific investigation subjects.

Firstly, we settled robotics as research topic, instead of AI, for following reasons: robotics is a sub-area of AI, and is tangible embodiment of AI in common perception, close to social awareness on AI; robotics is basic applications of AI; robotics and related equipment are large-scale applied in libraries nowadays; robotics is overlooked by some previous survey on AI & library, leaving study blank somehow; more important, as analysis at the beginning, robotics is the appropriate "reagent" to check out the respondents' understanding degree on AI.

Secondly, we focus on a considerable group who is also overlooked by early research, whose voice is ignored in a certain extent, that is common "library staff", the first-line practitioner in library. More important, most of them are not directed decision maker of AI adoption, but they are the direct affected ones in library. And they are on-site workmate with robot, the intimate contactor besides users now and later. So it is essential to make voice of library staff heard. Still, it's meaningful to know library staff awareness on AI, whether close to social cognition, or close to expert elite's view, by conceptualization through robotics.

Related research

There were several noteworthy studies touched above mentioned gaps, and partly referred to the objects we set. This study starts from the blank of those previous research left.

Wood and Evans (2018) conducted the survey "librarian perception of artificial intelligence", to check the opinions of academic librarians concerning the impact of AI on library profession. The results show optimistic mood on AI's effect from library which differ from the other professions even library expert's tendency. However, the attributes of respondent (such as working section or position) were not fully reported, those attributes could affect the understanding on AI. What's more, the survey settled on IBM's Watson as

representation of AI, for convenience of the respondent to conceptualize AI, but it eliminated other more AI applications or cognitions. That left the blank of what might be the effects of other aspects of AI, beyond the model of survey chose (Cox, 2018).

Cox, Pinfied and Rutter (2018) conducted another survey thought leaders' views on the likely impact of AI on academic libraries. Instead of questionnaire survey, they use interview method to get a comprehensive context and deep insight. The attributes of participants were defined explicitly, categorizing into three main groups: library managers, library commentators and non-library participants, which were summarized as "leaders". But it excludes the majority "non-leader" librarians.

It's also worth mentioning that above survey's respondents were mainly from UK and America, which means that revealed the situations primarily located in UK and American libraries. We suppose that AI application and cognition are related to nationality. However, survey data of other areas especially developing countries are lacking.

A pilot study

Methodology

According to the context and purples of this study, a pilot study was conducted, which acts as a basis of follow-up research. In the whole research design framework, interviews or questionnaires are arranged for libraries adopted robotics or ones plan to bring in robotics. Accordance with the preceding analysis, the robotics here refers to the tangible mechanical device in library that automatically performs complicated, to help patrons or librarians to complete their tasks, mainly saving their strength and lifting efficiency. The typical examples include reception robot, auxiliary robot system of self-service library, integrated system of robot and warehouse, automated guided vehicle, intelligent book access robot and so on (Wang, 2015). But virtual Chatbot is not included.

And common library staff as respondent of this study, are defined specifically, according to idea of Human Resource Management and reality of work. From view of institutional hierarchy, common library staff engage in groundwork; from view of work objects, they deal with specific information resource, user community, technique application and other service infrastructure, rather than subordinate staff; from view of job function, whose work embodies the unique function of library mission, rather than general administrative work. In reality of library, besides official regular employee, this sort of work is also taken by outsourcing staff, contract labor, part-time-job worker, intern and volunteer, who are also brought into respondents.

In the pilot study, we preliminarily choose 15 participants met above conditions as interviewee. They are from Chinese public library and academic library, some of these library adopts robotics, and some remain indeterminate. The interview brought open question, but center on robotics and AI in library. The questions were posed in certain sequence, from "actions implemented" (did the library adopt robotics) to "actions on schedule" (did the library plan to adopt robotics), to "rational cognition" (the notion of robotics), to "emotional cognition" (feel and concern on robotics). The AI concept as subordinate line integrates in to

dialogue followed by similar order. The interview transcripts provide some preliminary understanding and further context, contributes to design questionnaire and define sample for follow-up study.

Finding and discussion

From pilot study, we obtained following key insights and context information:

(1) The cognition "gaps" actually exists in librarian staff. Present different sensation and expression on robotics. In interview, we studiously avoided defining "robotics", to get librarian's description or assumption. Three respondents direct it straightly towards reception robot in library (ones with human-like appearance). These three respondents from libraries in developed areas. And many respondents mention self-service book borrowing and returning system, "as only application of robotics" in their libraries. One respondent mentions monitor screen to display big data. It may reveals that staff from libraries with different development degree (like automatic level), lack consensus on robotics.

(2) Meanwhile, robotics is no longer discussed separately, it is talked combined with AI or any other high technology as a whole nearly all the time. That is to say, when mention robotics, we usually refers to more technique applications, not limited to robotics itself. And the respondents often answer like this: "we have no robot, but we have…" or "besides robot, we have…"something else like RFID and so on. Which lead us to think that the new techniques at present are adopted in library as a whole solution, consists of diversity elements. Though single element is hard to represent the whole (like AI).

(3) Adoption of robotics depends on specific working environment. It is not a compulsory application in library. One respondent's answer is notable, they try to introduce automatic mechanical device into library stack room, but their library located in old building. The narrow space limits the use of machines. In addition, under budget pressure, adopt robotics is not the priority task usually. The library which adopt robotics often with considerable economic strength and circulation. Some respondents reveals they gave up robotics plan for cost-benefit considerations.

(4) On emotional level, job insecurity (Greehalgh & Rosenblatt, 1984) actually exists in librarian staff, it reflects the uncertain feeling on viability of the job and long-term career planning (Sverke, 2002), which are affected by robotics adoption. That is to say, robotics won't take away your job today or tomorrow, but makes you feel anxious every day. We found that job insecurity is almost from young-age respondents, who were mainly employed within three years. It might be explained by different thought on timeframe of technique adoption (Cox, 2018) and anticipation on technique becomes effective (Wood & Evans, 2018). For old staff, feel that they will retired during safe period before robotics impact (in 10-15 years).

(5) What's more, this kind of job insecurity is not only relevant with age of staff, but also with nature of employment or engagement form of staff. It is peculiar for library. The respondent as formal staff feel less anxious, when they compared with informal employee (like outsourcing staff). The formal staff think outsourcing staff and contract labor are "in danger" (be replaced by robotics). As analyzed above, robotics are mainly adopted by labor-intensive section or position in library, like print book inventory, stack and circulate. While staff like outsourcing staff, contract labor, part-time-job worker, student intern mostly work in the same field. Thus it could raise competitive or substitutional relationship.

(6) There is doubt on reliability and accurateness of robotics. As workmate of robot, some respondents couldn't fully trust robots' work. In the cases adopted robotics, almost arrange

people and robot to do the same task, not wholly reliant on robot. The remark of a respondent form collection section is significant: “after robot did the work, we sometimes need to do it again”.

Conclusions

The pilot study we conducted provides some basis, though limit in small sample locally, the finding could be the assumptions for large scale survey. For robotics, there are diverse understanding among library staff, reveals the cognition gap on this technique. In the conceptual level, staff from libraries with different development degree lack consensus on robotics. In the operational level, adoption of robotics depends on specific working environment. The library which adopt robotics often with considerable economic strength and circulation, arrange people and robot to do the same task, not wholly reliant on robot. In the emotional level, job insecurity affected by robotics indeed exists in librarian staff. Library staff (especially the young) feel worried not for losing jobs at once, but anxious for long-term career prospects. This kind of job insecurity is relevant with age and employment/engagement form. What’s more, reliability and accurateness of robotics are doubted by some librarian.

In a broader view, robotics is a sub-area of AI, an indispensable element of AI cluster or “bucket”, and the tangible embodiment of AI in common perception. At present, the library tend to adopt total solution integrated with various technique elements, rather than isolated technique. Like robotics is more talked and used with other more techniques. However, any single element (like robotics) is hard to represent the whole (like AI). Or else, if we just confined AI in certain form which perceive easily or imagine subjectively, we might ignore potential opportunity or threaten.

On the whole picture, we consider cognition gaps on AI exist in library. For library work is the representative one blended with knowledge-intensive pattern work and labor-intensive pattern work, provided a larger scale for AI techniques to apply, different section has its corresponding AI application, and different group within library community, from expert to first-line practitioner, has corresponding cognition. The potential risk may origin from the disparity of influence from different library group. Certain group may dominate in AI issue discussion and technique adoption, by their partial judgment on AI. That is why we decide to hear library staffs’ voice in this study.

Implications

Through this whole study, we try to interpret the robotics, AI and other more technique applications by frame in Fig 11. As general technique develop linear path, the technique is generated, adopted, operated and perceived by users.

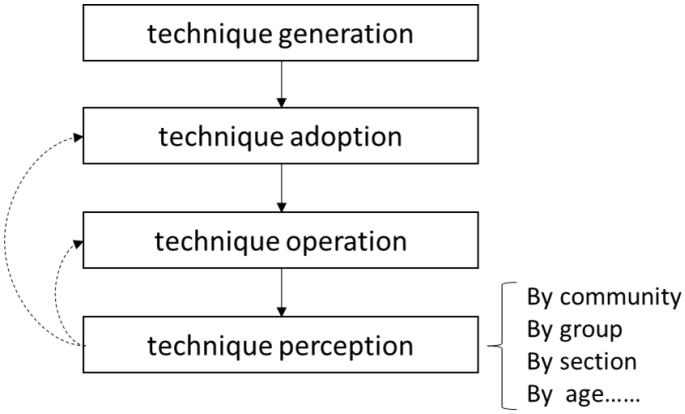

Fig 11 the 4 Layer Frame of a Technique

Traditionally, the impact is supposed to transmit from the previous stage to the next in sequence. For instance, we could only adopt what had generated, we could only operate what had adopted, and we could only perceive what had be running. In another word, the technique perception was affected by technique operation, adoption and their pre-stage.

But in reality, this linear path might be reversible, and more complicated. Take AI as example. Our perception on AI (we have talked a lot) sometime affects what kind of "AI" we adopt, and the way we operate. And the perception's origin is hard to generalize as "user" simply. The perception is from different community, group and section. And they have different influence on technique adoption.

It will bring us some implications. As librarian, we may not be over worrying on AI's impact. In fact, our librarian perception impacts and remoulds the fashionable technique all the time, form automation to digitization. We accept, reform or even reject the techniques, to adapt to library. That reminds me of the case one respondent mentioned, "robot to the old narrow bookshelf", it is also a symbol for new and old. Our perceptions are diverse, that implies us to hear different group's voice, but they still share some common things, origin from librarian value, mission and tradition.

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