Assisting Disabled Persons in Online Shopping: A Knowledge-Based Process Model

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Abstract: Knowledge management is gaining more and more attention from business management with a consideration of knowledge as a critical intellectual resource for organization in getting successful competitive advantage. The aim of integrating of KM processes with business processes is to add value, provide supports and increase productivity. The role of technology for knowledge management processes, i.e., capture, codification, dissemination, is very important. Organization are readily adapting e-commerce and shifting business activities over web to maintain competitive advantage and building strong relationship with suppliers, employees, and customers.

E-retailing emerged as a new way of shopping; people search/browse products online, compare and purchase with great convenience. It also eliminates barriers that disabled persons encounter when they visit shopping stores such as inaccessible entrance for wheelchair shoppers. However, still there is a significant part of disabled population is neglected from getting benefits of online shopping because of lack of accessibility features in websites. Understanding the knowledge about them can lead business managers to better facilitate in online shopping. This paper proposed a model based on the Nonaka Knowledge Spiral model to support business managers to capture knowledge about disabled person's online shopping behaviors; supplement this knowledge into their website to support disabled persons. This also helps business managers to capture the un-attended population in their business net.

Keywords: Knowledge management, Nonaka SECI model, disability support, e-commerce.

1. INTRODUCTION

Knowledge is considered as a driving force for running today's global economy [1]. In the knowledge-based economy, the intellectual capital of organization i.e. the knowledge and insights are treated as vital source for sustainability and competitive advantage. The knowledge and intelligence supplemented with organizational processes are intellectual resource for organization [2]. These organizational processes are different based on nature of organization and varies from organization to organization. Knowledge management processes are integrated into organizational processes with the intention of capturing of knowledge, conversion, dissemination, creation, and effectively utilization of organizational knowledge [3]. The objective of integration of Knowledge Management practice in organizational processes is adding values and increasing productivity of organization [3]. Knowledge Management is used as an effective tool for transformation of tacit knowledge into explicit that can effectively utilize for creation of new meaning to knowledge and innovation [4]. Explicit knowledge is codified and documented knowledge that is available in organization in the forms of spreadsheets, graphs, flowcharts, WebPages, audio and video slides.

The challenge in knowledge management practice is to capture the tacit knowledge. Making the tacit knowledge explicit is a hard and challenging task [5]. Innovation is the only effective way for organization to remain in business with competitive advantage [2]. Knowledge based economy has a competitive advantage over traditional economy [3]. Organization needs the capability to effectively handle the intellectual resource of knowledge and intelligence to get edge over other competitors.

1.1. Knowledge Management in Customer Oriented Organization

Implementing information and knowledge management system in organizations is business focused approach to facilitate the customers, while optimal utilize the available resource by better governance and management. Nurturing the environment that promotes culture of sharing corporate knowledge is a way to achieve competitive edge by providing better services and products to consumers while reducing cost; enhance staff quality and better customer care [6]. Businesses are always keen to acquire the competitive advantage and always search for and adapt those techniques which make them at competitive edge [7]. The extent to which this knowledge is re-utilized, the more it will generate return to the organization [3]. The process of knowledge capture, analysis, dissemination, reusing and creation of new knowledge works in a cycle in any knowledge-

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ISSN: 1814-8085 / E-ISSN: 1927-5129/16

based organization representing in SECI model proposed by Nonaka [8]. Organizations are readily adapting knowledge nurturing environment and knowledge management system infrastructure. Information and communication technology (ICT) provide greater support to and play an important role in success of knowledge management [6]. In customer oriented business, the main focus of managers to facilitate the customers efficiently [2, 9]. Understanding customer's specific requirement and expectations about products/services is necessary to remain competitive in customer oriented business [10]. The sole purpose for this practice is to capture the knowledge and reuse it for product/service innovation ultimately resulting in creation of new knowledge, which is an important factor in success and sustainable competitive advantage for organizations [4].

In customer oriented business, the interaction with the customers takes place in marketing, sales, after sale service or customer care, and field supports and CRM seamlessly integrated in all business areas that has direct interaction with customers. Keeping diverse trends and behaviors of shopping under consideration to facilitate the group of consumer is not easy. This is why shopping has gain very much attention from the business researchers [11]. With realization of the importance of the strategic value of managing relationship with customers in customer oriented business, customer relationship management system has already been adapted in many businesses [12].

Figure 1: CRM support to business processes [13].

Knowing about customers or managing knowledge about customers is made possible through technological advancement such as internet, improved data mining software, capability of managing large data (data warehousing) and big data analysis. Using data mining software, identification of hidden information can retrieve in minimal time and present in good manners [14]. Based on knowledge obtained through data mining, business managers can take knowledge-driven decision such as forecasting about future production & promotion launching to acquire new customer based.

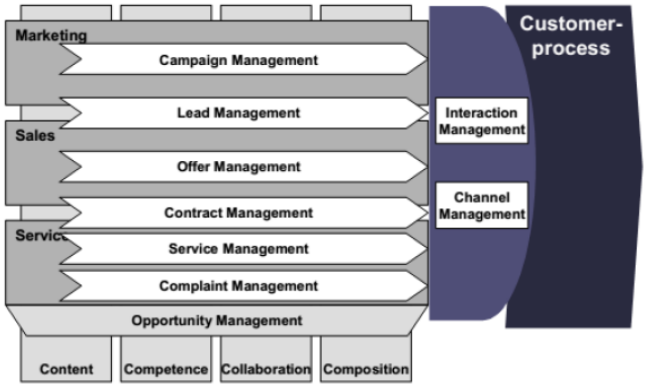

Figure 2: Customer Knowledge Management Model proposed in [15].

Customer Relationship Management facilitates business managers to know more about their customers and enabled them to take knowledge-driven decisions. However, it does not tell about what customers think about products and services offered by organization. This gap is filled by Customer Knowledge Management. The strategy behind widely adaptation and implementation CKM tools in firms and organization is to transform their customers' base from a passive recipient to active participants [16]. Capturing the knowledge that customers hold is important for organization because it enables organization to improve the quality of products/service, product innovations, better customer care and customer respect & satisfaction [16]. Through web-based application to get feedbacks, suggestion and reviews from consumers, organizations get valuable and vital knowledge about their expectations, grievance and requirements. Organizations manage, assess, evaluate this knowledge and utilize this knowledge in product development to reflect the impact of customers' perception. Reflection of impact of customers' insight into product is a considerable reason for customers' loyalty and retention [12].

The emergence of e-business and e-commerce commence new technological highways for doing business in the highly competitive environment. E-commerce provides online presence to organizations, independent of time and space boundaries and play important role in success of organization by changing

the shape of competition, i.e. doing business virtually [17]. In the new era of internet [18], the basis for survival and competition is presence in virtual space and effectiveness in management of knowledge. Knowledge management is a targeted process that is aimed to assist organization in better understanding of customer, embedding this knowledge into organizational knowledge-base and to develop a work force that has customer-focused attitude [15, 17].

2. DISABILITY, E-COMMERCE AND KNOWLEDGE MANAGEMENT

Persons with Disability contribute 15% of total world population which is approximately counting to 1 billion of population. The demographic focal is shifting in global population from younger to old and older population is become dominating and one of the most growing user groups in societies [19, 20]. The older population is affected by age related disabilities. The prevalence of disability is higher in lower income countries and more common in women, older people and household [21].

Disabled persons face barriers in accessing services due to physical infrastructure and non-adoption of specialized ways proposed for them. The adoption of specialized infrastructure in building design, the adoption specialized ways and utilization of information and communication technologies for betterment in provision of service will help disabled and elder persons in avoiding these barriers [22].

The most discussed legislation that focused on inclusion of persons with disability in mainstream is the ADA (American with Disability Act). The purpose of this act is promising equal possibilities and opportunities for persons with disability in different walks of life. Article III of the subject Act promises that commercial and public places will be made accessible to disabled persons.

Disabled and elder persons face problems in shopping and they need an environment that helps them to enable in carrying out shopping. Physical infrastructure of shopping store, proper signage, guiding ways, and cooperative sales persons are important factors that create the environment of shopping store. An enabled environment is the accessible environment that enables persons with disability to experience the shopping easily [23]. Although persons with disability face difficulties due to various obstacles, still disabled persons shared a segment of market equal to $200 billion [24]. Their market segment can be doubled or tripled if accessible environment is provisioned to disabled and elder persons in physical shopping stores.

Disability studies largely based on two famous, contrasting each other, models i.e. Medical Model and Social Model [25, 26]. Both the model stressed on changing something so that persons with disability can be integrated in the society. In simple words, the medical seeks to fix the disability by rehabilitation, on the other side; the social model of disability seeks to restructure the surrounding environment. In medical model, the focus is on fixing the disability by treating medically or by providing Assistive Technology or by learning additional ways so that they could adapt themselves in society. Contrasting to this, the social model is emphasis on change the environment in order to accommodate the needs of disabled and elder persons [25] so that have a barrier-free access in society.

The success of retail business is no more focused on physical spaces; the world population shopping behavior is trending towards e-retailing. Only Americans spent $186 billion in online transactions. 85% of Asian population is shopping on online site [27]. Organization readily realizing the importance of knowledge-based, technology-driven, customer-centric process and integrating these process to organizational process to meet customer's need, there are still unattended avenues of knowledge in customer oriented business i.e. the disabled segment [28]. For this paper, e-retailing is our concern in perspective of knowledge management and disability/elderly support [21, 23].

This paper proposed a process model of knowledge management based on the Nonaka SECI model [8] to support business managers to understand the requirement of disabled/elder population and embed this knowledge into business process. The embedding of knowledge about the needs and requirements of disabled and elderly population [23] into business process helps in transformation of e-retailing process towards more accessible for them. It is an indirect approach to support disabled and elderly population.

3. E-RETAILING AS ENABLER FOR DISABLED IN SHOPPING

Researches indicate that disabled and elder persons has less availability of computers and less access to use online resource and services or use of internet, however, recent data indicated that this trend

is now changing and disabled persons are catching up in owning the personal computer [29]. Several researches have been conducted that indicates that disabled persons spend more time using internet than non-disabled counterpart. However, no specific data indicates that how much time they spend for online shopping. Moreover; the traditional way of computing by using desktop PC with keyboard and mouse is changing towards handheld devices. The proliferation of handheld devices like Tablet PC and Smartphone, technological advancement in networking services i.e. Wi-Fi, 3G and 4G mobile services and decreasing trends in price of bandwidth, change the way the computing. The changing trend also has good impact for disabled and elder persons as they have a barrier free access to computer and online resources.

Physically visiting of a shopping store has certain issues for disabled and elder persons. Most of shopping stores, malls and other marketplaces are designed keeping in view that their customers as "able-bodied persons", and expect that customers are fully able and can perform shopping related tasks easily without any help [30]. The aspect of this design represents the "medical model of disability" as they presume that disabled and elder persons visit marketplaces along with someone to help them in entering into shopping mall, in performing shopping related tasks such as searching required products, read product specifications and price, payment [29].

The customer perspective regarding shopping is that they want full control in performing each task so that they can feel control in their decisions and actions [29]. Disabled and elder people also want a feeling of normality in shopping experience. In other words, they require that marketplaces should have a design of "social model of disability" that enable them in their actions and decisions [32]. The feel of powerlessness and control-less badly affect the shopping experience for disabled and elder persons.

E-retailing (online shopping) has emerged as an enabled environment for most of disabled and elder persons. They can browse the items, compare prices online with other e-retailers, pay online and enjoy home delivery option with little or no cost. They feel full control in making decisions and perform shopping related task full control thus shopping becomes a joyful experience for them.

Despite all benefits associated with e-commerce [31] for disabled and elder, there is still some segment of disabled and elder population for which e-retailing is failed. In [29], Carol Kaufman-Scarborough and Terry L. Childers raised an interesting question that "are online e-commerce websites a public place?" if so, should these virtual public place follow the ADA rules? Legislation on disability such as ADA does not cover the internet environment; however, critics have been noted for making online environment more accessible and useable. Depending upon the nature of disability, online access and web surfing either for shopping or for other purpose, is limited and required assistive technology by means of hardware such as specialized keyboard & mouse, joysticks, trackball and by means of software and accessible features such as screen reader, high contrast vision, speech recognition system for command input.

As both the medical model and social model of disability exist in physical environment, the same model can also exist in online environment. The online shopping experience of disable and elder persons can be made more joyful instead of upsetting by improving the website design, by adapting the accessible features.

Disabled persons are also interested in online shopping, browse through items, purchase items online securely and return & replace items. The web sites should be designed so that disabled persons are enabled to access and make shopping online as able-bodied persons do in their routine [29]. Inconsistent design of websites and specific designing of online shopping Apps emphasis that there must be a standard design and format of websites that include disabled persons.

3.1. Nonaka Knowledge Model for Disabled & Elder Persons in Shopping

In perspective of Nonaka Spiral Knowledge model, the place for knowledge creation is "ba" [8], a Japanese word representing the shared space where interaction takes place between people that holds knowledge. Through interaction between people, knowledge spreads and grows and become the basis for creation of new knowledge.

In view of Nonaka model, "ba" can be physical, virtual or mental space. E-retailing website are virtual spaces and interaction is takes place between people i.e. buyers and sellers. The knowledge generated through interaction of buyers and sellers diverse in nature, subjective and bi-directional. Organizations try

to capture the valuable knowledge about their existing and potential customers through CRM and CKM. Understanding about existing customers helps organization to alter their services according to the need of customers so that customer retention and loyalty can be achieved. Through analyzing the information, the potential segment of customers is revealed and efforts are made to get this potential segment in their business net. Disabled and elder persons are an un-attended segment of e-commerce just because of lacking of accessibility features [23].

Figure **3** indicates the Nonaka Knowledge Model for Disabled Shopping. The brief description of Nonaka Knowledge Spiral Model four quadrants are given below:

3.1.1. Socialization

In Nonaka SECI model, the first quadrant represents knowledge transfer between people during interaction. Transfer of knowledge takes place when people in social interaction; share their experiences, insights and methods or rule of thumbs they used to solve problems and other people learns from their insights. At this stage; the transfer of tacit knowledge between people remains tacit.

Customers share their products purchasing experience, share comments about quality of products and services offered by organizations such as product delivery, after sale support and warranty claim. In the same manner, disabled persons share their experience in interviews, questionnaire for research and on other collaborative forums. It is valuable knowledge in perspective of business as knowing your customer is a key to success of business. The knowledge about disabled and elder persons' needs and the assistance they require from organization in online shopping helps business managers to incorporate in their business process. Business manager's share this knowledge to their co-workers, middle and high management of organizations as well as in their community of practice. At this quadrant, however, this knowledge remains tacit.

3.1.2. Externalization

Business managers adapt changes in their services based on knowledge gain during socialization, and display results in the form of reports, charts and articles. At this stage, tacit knowledge transform into explicit.

After studying the reports and article, analyst analyze the decisions and made critiques. Based on analysis, changes are either accepted or rejected and if accepted, these changes are widely adapted in business.

The knowledge is then codify in the form of research reports specifying the needs and assistance required by disabled shoppers, proposing features that should be adapted by shopping centers and store.

3.1.3. Combination

At this phase, after codification of the knowledge of workers and managers, the knowledge is added to

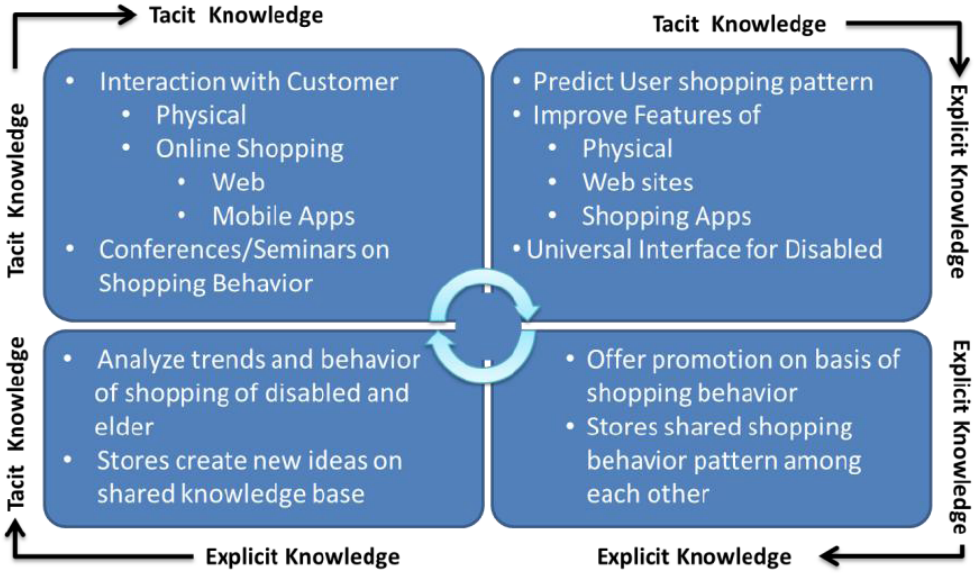

Figure 3: Nonaka knowledge spiral model representation for assistance in online shopping.

organization main knowledge repository. No new knowledge is created in the combination process of knowledge conversion model. Instead, exiting knowledge gets new shapes such as figures about population represented in graphs, synthesis about a report, a brief executive summary, and a new database for organization of knowledge. Combination can be best understood as existing knowledge representation in different point of views so that it could be better understand and communicate.

Organization analyzes new knowledge, categorizes and linked with other knowledge. Organizations critically analyze their previous decisions and lacking. Based on analysis, organizations offer new and improved accessible service and features in their online resource to better serve the disabled community.

3.1.4. Internalization

In the process of internalization, individuals internalize the existing explicit knowledge in the form of best practices, experiences, failed projects, lesson learned, contextualized information. Integration of existing shared experiences and knowledge take shapes of individual mental model. After internalizing the others shared knowledge, individuals use this knowledge, extend it, broaden it and utilize it in the frame of their exiting knowledge. After internalizing the knowledge, there is a great change appears in the individual working styles and they perform their job efficiently and more effectively.

When knowledge is completely internalized by an individual and become the part of his tacit knowledge then this knowledge becomes valuable and useful part of his knowledge base. After this, it benefited the individual, its organization and community of practices, by sharing and extending this knowledge through knowledge spiral model. The individual transfer this knowledge through imitation, observation and practice, he enters into the socialization process of knowledge conversion model where his own tacit knowledge converted into explicit knowledge.

Based on the shared knowledge, features are implemented, special training are conduct for sales representative focusing of disabled persons. New knowledge is shared across organization and it will internalize by employees of organization. After internalizing and combining with their existing knowledge, they are being able to create new knowledge on the basis of shared knowledge, hence; knowledge process cycle remain continues. Creation of new knowledge is vital for any organization as new knowledge leads to innovation and innovation leads to sustainable competitive advantage.

As organizations learn from their experiences, the extent to which they integrate and utilize knowledge in business process, the more outcome organization achieved. The outcome in terms of maximization in profit, increase in customer base.

3.2. Shopping your way

Lack of accessible features in website design is causing the digital exclusion of disabled and elder persons. Various issues related to e-commerce website in perspective of disability and elderly is discussed in [23][29] including physical, sensory and cognitive impairments. It is identified that mobility and vision impairments are type of disability that cause website surfing inaccessible.

Product / Service quality and assortment, availability of service/products, quality and pricing comparison, stores' policy of purchasing and replacement, time being served and service procedure, well behaved service personnel are factors that affect disabled and elder persons while they visit shopping stores. Improper infrastructure of shopping stores, inability of access to every corner, navigation to specific part of shopping store for example food section, garments section, and improper service personnel are common factors that irritate disabled and elder persons and resulted in a shopping experience that they do not want to repeat. On the other hand, inconsistent design of e-retailing websites is a major factor influencing navigation of website. User-centered design approach may help to overcome the accessibility problems. However, as there are diverse nature of disabilities, i.e., mobility, sensory, cognitive, it could be difficult to cater everyone's needs. Improvement in handheld computational devices, in terms of computation power, amount of memory & large display and in terms of enhanced features, i.e., Speech enabled interface, touch screen, location tracking using GPS, expand the possibilities for disabled and elder population to benefitted from digital world.

Considering the advantages and the limitation of internet shopping, a conceptual Online Shopping Model for assisting disable and elder persons is proposed in Figure **4**. The proposed online shopping model emphasizes on an App that has a consistent interface. Disabled persons add shopping stores and website that

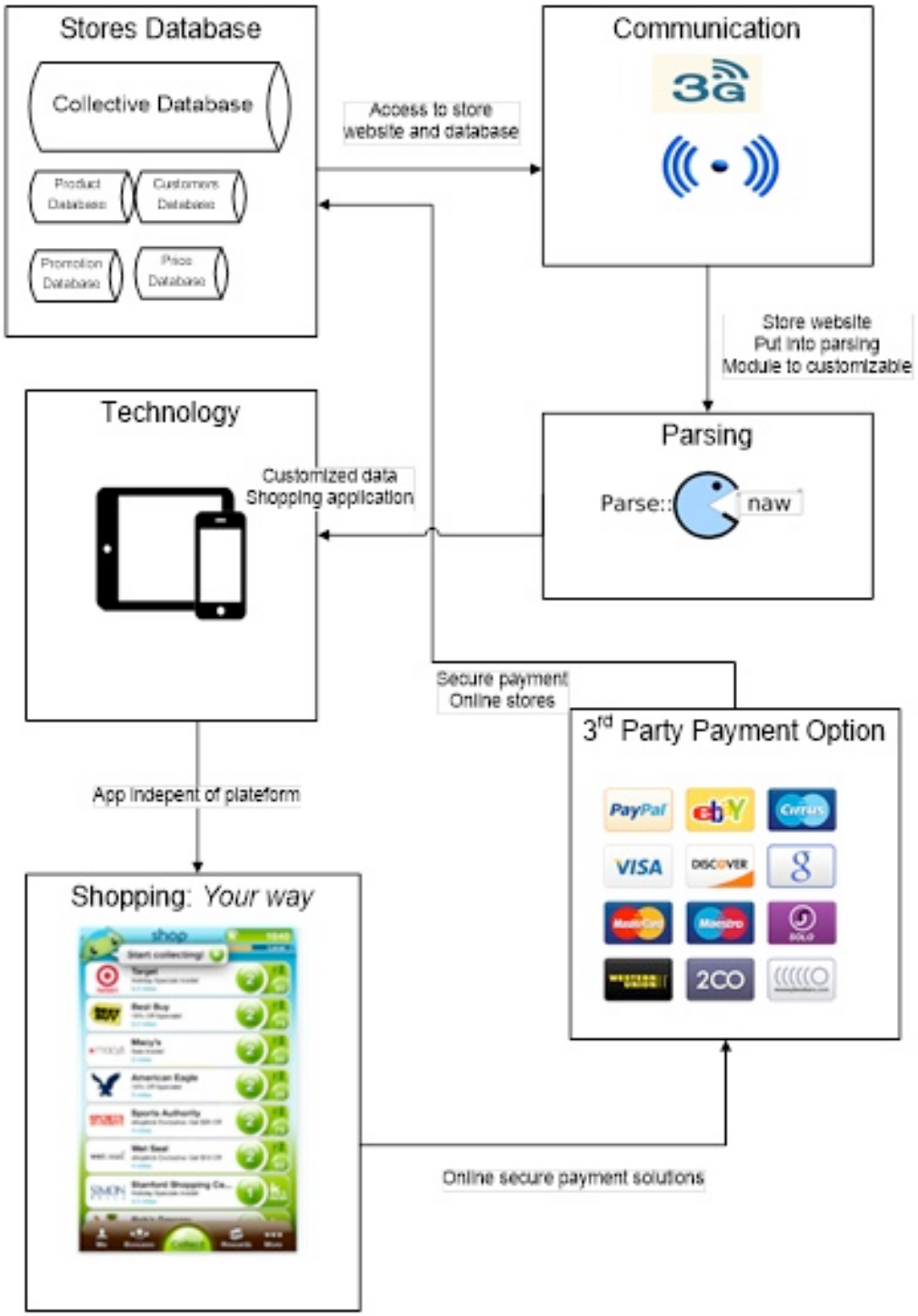

Figure 4: Shopping your way.

offer online shopping into top of interface of App. In this way, only selection of particular store or website is required, the way information is displayed remains consistent as customized by the user i.e. disabled persons.

It has different specific modes according to different group of disabilities such as for vision impairment, hearing impairment, physical impairments and cognitive impairment. These modes have some predefined setting in order to accommodate the needs of that specific disability. Apart from these specific modes, some features are provided which are independent of these modes and can be opted by user, i.e., disabled and elder persons. These features are listed down:

- Text size enlarge
- Image size zoom
- Text to speech for blind and vision impaired persons
- Speech enabled searching and selection of items for motor disabled persons
- Description of Image by touch for blind persons
- Closed captioning in videos for hearing disabled persons

These features help disabled and elder persons to customize the interface and way of interaction with App. The consistent interface offers greater usability for disabled and elder persons so that they could not be confused by different layouts and designs of e-retailing websites and apps. The interface can also be customizable by user according to his desires. User can opt for specific information to be displayed and other information did not display. For example, if someone is allergic with peanut, he or she may interested to display the ingredients information so that all those products could be avoided those have peanuts. Muslims and Jewish may interested in Halal or Kocher foods and want to display this specific information. Text to speech option can be opted so that their desired information can be listening and screen could be used for other useful information.

The online shopping model for disabled and elder persons is proposed to enhance quality of life and to prevent them from digital exclusion. Their shopping behaviors and trends helps business managers to more effectively serve this segment of population which not only benefitted to disabled and elder persons but also business managers to increase their customer's base and profit.

4. CONCLUSION

Disabled and elder persons faced barriers while intended to access different services such as education, healthcare, and employment to name a few. The enforcement of ADA in United State, public places are essentially made accessible for disabled and elder persons in order to avoid discrimination.

As knowledge plays a critical role for success of any organization and organizations striving hard to capture the knowledge originated from the customers. Customer relationship management system and customer knowledge management system facilitate organization to capture the valuable customer knowledge.

This study investigates the role of knowledge in e-commerce in perspective of disability and proposed a knowledge spiral model to assist business manager in capturing knowledge about disabled and elder persons. Disabled and elder persons, due to their disability and age related impairments, are unable to enjoy shopping in physical store based on different factors such as inaccessible infrastructure, lack of proper signage etc. causing a social exclusion from the mainstream of population. E-commerce website facilitates them to search, browse, purchase with a feeling of liberty and with full control on their decision. Still there is a significant segment of disabled and elder population experience a digital exclusion due to lack of accessibility feature from e-commerce website.

This paper proposed an online shopping model in which disabled and elder persons are supported in online shopping by adapting consistent interface for different online website. The proposed application has the feature of customization of interface so that can customize the interface according to their convenience. Other accessibility features such as speech enabled searching, contrast change according to user need for vision impaired persons, close captioned for video for hearing impaired are also proposed.

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Received on 13-10-2015 Accepted on 01-12-2015 Published on 25-01-2016

http://dx.doi.org/10.6000/1927-5129.2016.12.04