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Finding KM solutions for a volunteer-based non-profit organization

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Abstract

Purpose – The purpose of this paper is to investigate the knowledge needs of a small, volunteer-based Non-Profit Organization (NPO) and present recommendations for implementation of KM solutions.

Design/methodology/approach – The methodology used in this paper is the knowledge audit. Data collection methods include semi-structured interviews, documentary photography, and a review of content on the NPO's website.

Findings – The paper recommends a combination of web 2.0 technology and low-tech solutions to meet the KM needs of the volunteer-based organization within the constraints of its limited resources. Based on the observation that dedicated and reliable volunteers are critical to this organization's success, the paper proposes that the KM solution address personal knowledge needs related to volunteer motivation factors as a strategy for improving volunteer recruitment and retention.

Research limitations/implications – The study examined a small group of volunteers engaged in a specialized form of knowledge-sharing work. Future research could test this paper's conclusions in larger and more diverse volunteer-based NPOs.

Originality/value – The paper extends KM research into the realm of volunteer-based NPOs and adopts elements from Motivation-Hygiene theory as well as specific volunteer motivation factors as additional criteria for a KM solution.

Keywords Knowledge management, Non-profit organizations, Motivation-Hygiene theory

Paper type Research paper

1. Introduction

The theoretical foundations of Knowledge Management (KM) and its importance in effective organizations are well known (Nonaka, 1994; Cook and Brown, 1999; Baskerville and Dulipovici, 2006). KM facilitates the sharing of tacit and explicit knowledge between individuals and across organizations to meet organizational knowledge needs. While KM has found strong support in For-Profit Organizations (FPOs), especially large organizations that require large scale application, comparatively less attention has been given to KM in smaller Non-Profit Organizations (NPOs) and Non-Government

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Organizations (NGOs). Even less focus has been given to its application in volunteer communities. Managing knowledge has proven a significant challenge for FPOs, and there is no reason to think that volunteer communities do not also face similar difficulties. KM's significance in any domain cannot be underestimated, and there are many questions concerning the use of KM in volunteer communities that deserve exploration. For example, how can KM benefit small volunteer communities, what are the technological barriers to adopting KM systems, what is the perception of KM among volunteers, and what innovative approaches should be adopted by volunteers to manage knowledge within a community?

The researchers set out to explore these questions by proposing a knowledge audit of a volunteer-based NPO to understand how its volunteers manage and share knowledge, and examine ways that current KM theories, tools, and technologies might augment the knowledge sharing within the community. A community bicycle repair workshop was selected for the study, and semi-structured interviews were conducted with volunteers to identify knowledge needs, sources, channels, gaps, and sinks. In the midst of preparing the audit, it became apparent that volunteer recruitment and retention were both crucial to organizational success. Closer examination revealed that the group demonstrated characteristics of a Community of Practice (CoP), and that key volunteer motivations were related to knowledge sharing. This prompted the researchers to propose a KM solution that could address both conventional knowledge needs as well as those related to volunteer motivation factors. To provide an additional set of criteria for the KM solution, motivation factors expressed by the participants were combined with elements from the Motivation-Hygiene theory of Herzberg et al. This paper presents a two-part KM framework, comprised technological and non-technological components, to bridge the identified knowledge gaps, streamline knowledge channels, augment knowledge sources, and address key volunteer motivation factors. It is hoped that an increase in knowledge sharing and participation in the organization's CoP will improve overall operational effectiveness.

2. Literature review

2.1 *Bicycle culture and communities*

Urban cycling in North America engenders a unique subculture of cyclists (Boelte, 2010) who value cycling as a form of transportation and see bicycle culture as an alternative to the car culture and car systems described by Urry (2004) and others (DeMaio, 2003; Blickstein and Hanson, 2001). In contrast to sports cyclists, urban cyclists ride for transportation, fitness, and leisure, and collaborate in informal communities and formal societies that advance their needs and interests (Furness, 2005). Transportation Alternatives, established in New York City in 1973, is one of the oldest bicycle societies in North America.

A common feature of bicycle societies is the community bicycle workshop, often staffed by volunteers, which provides workspace, tools, parts, and guidance for do-it-yourself bicycle repair. Workshops may offer other services, such as formal instruction programs (Community Bicycle Network, 2008), "earn-a-bike" programs where at-risk youth learn bicycle repair and earn a bicycle (PEDAL, 2008), or programs to repair bicycles and donate them to developing countries (Bikes Not Bombs, 2008). The *Bike Collective Network* (www.bikecollectives.org) offers a directory of known workshops across North America and resources for establishing new workshops.

Information sharing plays a key role in bicycle culture, and cyclists participate in this through traditional media, such as the magazine *Momentum*, as well as more actively through online technologies, such as:

- mapping (e.g., www.bikely.com);
- vodcasts and tutorials (e.g., <http://bicycletutor.com>);
- blogs (e.g., www.howtofixbikes.ca); and
- discussion forums (e.g., www.bikeforums.net).

2.2 KM in NPOs and NGOs

KM has its roots in the domain of business, and so its theory and early developments addressed the needs of large international FPOs (Nonaka, 1994; Prusak, 2001; Blair, 2002). More recently, the discussion of KM in NPOs and NGOs has gained momentum (Larson *et al.*, 2005; Gilmour and Stancliffe, 2004; Lettieri *et al.*, 2004). Large NPOs and FPOs have similar operational needs, such as human resources, IT resources, and customer service. Much like FPOs, NPOs and NGOs must compete for sponsors, ensure effective and efficient operations, and undertake public promotion, and KM plays an important role in these functions (Lettieri *et al.*, 2004; Kiple *et al.*, 2008; Helmig *et al.*, 2004; Kong and Prior, 2008; Gregory and Rathi, 2008).

Recognition of the unique characteristics of small-scale NPOs and volunteer communities has led to an emerging interest in their KM needs (Lemieux and Dalkir, 2006; Gregory and Rathi, 2008). Drawing on the small business literature, Hume and Hume (2008) argue that a small NPO, such as a community organization, with limited resources to implement the portals and intranets of large scale KM systems, can still benefit from KM to “enhance product development and/or service delivery”. They propose that a small NPO exploit its strengths, which often include a “stronger informal network”; build incrementally; and mimic expensive KM functionality with common, inexpensive technologies, such as email. NPOs that lack technological capability or familiarity may also look to non-technological solutions, such as reducing employee turnover to retain implicit knowledge (Matzkin, 2008), or pursue a “robust communications exchange network” (Kiple *et al.*, 2008) with free webware and open-source products (Gregory and Rathi, 2008).

2.3 Communities of Practice (CoP)

The bicycle workshop examined in this study possesses a distinct volunteer community that demonstrates characteristics of a community of practice (CoP). A CoP is a group whose members “share a passion for something [...] and who interact regularly in order to learn” (Wenger, 2004). Wenger (2000) has identified three basic elements of a CoP: members of a community are engaged in a “joint enterprise”, use mutual forms of engagement, and draw upon on a common repertoire of language, routines, tools, and resources. CoP theory recognizes that social structure, social participation, and relationships (Lavé and Wenger, 1991) play an important role in developing engagement in knowledge building (Hara and Kling, 2005). By generating an atmosphere of learning and sharing, CoPs have the power to weave an organization together around knowledge needs, steward specific competencies, and provide a home for diverse identities (Wenger, 2000). They have been used in FPOs to foster tacit and

explicit knowledge sharing (Duguid, 2005), and as trusted forums (Hanley, 1999), using technology to supplement face-to-face interactions (Hara and Kling, 2005).

2.4 Motivation-hygiene theory and volunteer motivation theory

Herzberg, Mausner, and Snyderman introduced their influential Motivation-Hygiene theory, also called the two-factor theory, in 1959 (Herzberg *et al.*, 1959). The research identifies factors related to job satisfaction and relates long-term job satisfaction with employee motivation. Factors associated with long-term satisfaction include achievement, recognition, the work itself, responsibility, and advancement. Other factors, most often found in accounts of job dissatisfaction, are designated as hygiene factors, since addressing them will prevent dissatisfaction but will never succeed in motivating employees. These factors include company policy and administration, supervision, salary, interpersonal relations with supervision, and working conditions.

Conflicting views on the veracity of the theory have been voiced since it was first published (Brockman, 1971), and the criticisms have themselves been challenged (Grigaliunas and Wiener, 1974). The theory remains difficult to validate or repudiate, perhaps because of its simplicity and general nature (Smerek and Peterson, 2007), which also number among its strengths. There is, however, a general consensus that factors related to the work itself are what motivate people in their jobs (Henderson, 1981; Smerek and Peterson, 2007). Indeed, for Herzberg *et al.*, motivating factors lead to job satisfaction because “they satisfy the individual’s need for self-actualization in his work” (Herzberg *et al.*, 1959).

As one of the most significant theories of job satisfaction, Motivation-Hygiene theory is referenced in the literature on volunteerism (Henderson, 1981; Boz and Palaz, 2007), but its factors are not generally mapped to volunteer motivations, possibly because volunteers have been found to have distinct and more variable motivating factors. Clary and Snyder (1999) have advanced and tested a functional model that identifies six functions individuals may seek to fulfil when volunteering: a values function, an understanding function, an enhancement function, a career function, a social function, and a protective function to combat personal anxieties. Boz and Palaz (2007) identify altruism, affiliation, and personal improvement. Henderson (1981), examining adult involvement with a youth group, finds family connection to the cause, enjoyment in helping others, enjoyment in associating with youth, and a desire to influence or teach as factors.

In each case, the relevant motivation factors will vary, depending on the circumstances and personality of the individual volunteer (Dolnicar and Randle, 2007). At the same time, altruism, socializing, learning, and personal relevance emerge as common themes. Many of these factors share a similarity with the motivation factors of Motivation-Hygiene theory, in the sense that they are intrinsic to the work and personal identity of the volunteer. The motivation factors that appear to indicate self interest, such as acquisition of social capital or networking, may, in some cases, also reflect either intrinsic motivations (Degli Antoni, 2009). An important distinction to be made between motivation factors in the workforce and motivation factors for volunteers is that low job satisfaction in a volunteer is more likely to result in the loss of that volunteer, who is always free to choose another use for his or her time. In this sense, adequately addressing volunteer motivation and hygiene factors becomes a “make or break” proposition for volunteer-based organizations.

3. Research design

3.1 Selection of volunteer NPO

In order to discover the potential for KM in a non-profit, volunteer environment, a community bicycle workshop in a major Canadian city was chosen for study. The scope was limited to the workshop and not the parent bicycle society that sponsors it. Therefore, the study did not seek to address the full range of NPO functions, such as fundraising and strategic planning, but only the operations that involve the workshop volunteers.

The bicycle workshop occupies a small industrial garage in a central part of the city. It is open to the public and offers, without charge, workspace and tools for cyclists to make repairs or perform maintenance on their bicycles. Volunteer mechanics are always available to offer advice and guidance to clients. Other volunteer tasks include repairing donated bicycles for resale, selling refurbished bicycles and parts, operating the heating system during the winter, and safeguarding a cashbox. For each day of the week that the workshop is open, a senior or regular volunteer is designated by the board of the parent bicycle society and given responsibility for opening and closing the workshop on that day, setting prices for parts and bicycles, and supervising any casual volunteers. Casual volunteers drop in when they can but are not given the weekly responsibility of the senior volunteers. From September to May, the facility is open two or three days per week, depending on the number of active regular volunteers. During the summer months, a paid, full-time mechanic is sometimes hired to supplement the volunteers and allow more open hours; however, this study did not concern itself with the paid mechanics.

3.2 Knowledge audit

A knowledge audit is a tool for creating a map of an organization's knowledge needs and assets. It "plays a key role in identifying a knowledge management strategy" for an organization (Liebowitz *et al.*, 2000), and is intended to identify several elements:

- the types of knowledge needed to support an organization's operations;
- acknowledged sources of knowledge;
- channels by which knowledge is shared;
- gaps between knowledge needs and sources;
- sinks, where knowledge is shared, but remains unused; and
- pools of untapped knowledge.

Based on a model and methods proposed by Burnett *et al.* (2004) and Liebowitz *et al.* (2000), a knowledge audit was conducted at the workshop. The primary method of data collection was one-on-one semi-structured interviews. Five male volunteers of the workshop were interviewed. The interviews, which ranged in length from thirty to forty-five minutes, were recorded and transcribed for analysis. In addition, the website of the sponsoring bicycle society was reviewed and photographs were taken of the workshop. Content analysis of this data supplemented the interview data. At the time of the study, there were eleven workshop volunteers, mostly male, of whom five were established, regular volunteers, three were casual volunteers, and three were new volunteers. The sample set of this study includes three of the established regular volunteers and two of the casual volunteers. Although the sample size is less than the

twelve participants recommended for qualitative interviews by Guest *et al.* (2006), it is appropriate for a case study with a homogeneous group of subject experts (Onwuegbuzie and Collins, 2007). The likelihood of theoretical saturation is high, given the small size of the target population.

4. Findings

4.1 Knowledge needs

Two initial categories of knowledge needs are identified: *operational knowledge needs* and *technical knowledge needs*. Operational *knowledge needs* refers to knowledge, unrelated to bicycle repair, needed to operate the workshop. Examples include workshop protocols and policies, as set by the society board; safety procedures; how to operate the temperamental heating system; and how to set prices of bicycles for sale. *Technical knowledge needs* refers to knowledge needed to help clients make repairs. Examples include how to make basic repairs, such as fixing flat tires; how to repair specialized bicycles, such as tandem bicycles; how to customize bicycles; and how to use specialized tools, such as the headset press. It is clear from the interviews that most technical bicycle problems encountered by volunteers are basic and easily solved. A common aspect of both categories of needed knowledge is that the need generally arises from a problem at hand, meaning that immediately available knowledge sources are overwhelmingly preferred.

4.2 Knowledge sources

In general, sources of knowledge internal to the workshop and bicycle society are preferred over external sources. The type of internal source volunteers value most is other people, whether they be volunteers, society board members, or expert clients in the workshop. In fact, anyone present in the workshop is considered a potential source and there is a strong preference for immediate sources. This finding is in line with the importance of immediate knowledge articulated by KM researchers in the business domain (Kersten, 1993). Society board members are a source for information about the activities of the society and workshop policy decisions. Other internal sources include formal courses run at the workshop and a small collection of repair books. External sources include experts not part of the workshop community; commercial bicycle shops; and the websites of Sheldon Brown (www.sheldonbrown.com) and the Park Tool Company (www.parktool.com).

4.3 Knowledge channels

As is the case in many small NPOs (Gregory and Rathi, 2008), knowledge sharing is found to occur mainly through informal channels. The primary knowledge channel, preferred for sharing all types of knowledge, is face-to-face communication, which simulates an apprenticeship model. Many volunteers learn new skills and solve problems by asking questions, observing others, and using trial-and-error methods with the guidance of an expert. An expert might be another volunteer or even a knowledgeable client. The workshop layout deliberately encourages this interaction, as the bicycle repair stands are arranged in a circle so that users can see what others are working on. Training courses, a formal version of this face-to-face method, are occasionally offered to the public by senior volunteers, and other volunteers, especially newer ones, may attend these courses. A phone in the workshop is sometimes used to

find answers to operational questions, but rarely to solve repair problems. Blackboards and whiteboards in the workshop, which volunteers could use for communication, remain underused. The website of the parent society solicits repair questions and posts answers, but this channel is underutilized. Email and a listserv are used to communicate between the society board and volunteers, though the volunteers themselves rarely use email or listserv to communicate amongst themselves. Finally, when a volunteer lacks the knowledge to answer a client's question, he will commonly refer that client to a volunteer working on another day for expert advice.

4.4 Knowledge gaps

The participants hesitate to identify gaps in knowledge sharing, expressing the opinion that the status quo is perfectly acceptable. However, analysis of the interview data reveals several gaps. First and foremost, there is a gap in exchanging *operational knowledge*, which has led to conflicting interpretations of policies and inconsistent practices. One example is that improper labelling of bicycles in the workshop has resulted in some bicycles being sold by accident. Another example is that the heating system suffers recurring failures, but the knowledge to fix it is not effectively shared with all volunteers. This knowledge gap is the result of several factors: an absence of documented policies and procedures, a communications gap between the board and the volunteers, and a limited amount of communication amongst the volunteers themselves. One reason communication between volunteers is low away from the workshop is that volunteers wish to guard their personal time from onerous volunteer obligations.

Second, there is a lack of formal training of volunteers for safety procedures, first aid, and customer relations. Third, there is no method to verify that a client has successfully been referred to an expert volunteer on another night, which may mean a poor service experience for the client. Fourth, there exists a knowledge gap in identifying experts within the volunteer and bicycle society communities. While the senior volunteers have developed their own knowledge networks, new volunteers can only access these knowledge networks through senior volunteers or by asking around.

4.5 Knowledge sinks

Knowledge sinks, which occur when knowledge is shared but does not reach its intended recipients, are symptomatic of break-downs in communication channels. For the workshop volunteers, email has created the conditions for a knowledge sink. Requests from the board for input or feedback from volunteers often receive no reply, making it difficult to verify whether a message has been received. One volunteer indicates he was not on the listserv until recently. Participants express the belief that a set of policies for the workshop exist but admit they are mostly unwritten. Changes to policy made by the board sometimes become lost in communication.

4.6 Knowledge pools

There are several untapped or underutilized sources of knowledge within the workshop. Volunteers tend to approach the same people on a recurring basis when they need information or knowledge. This means that the expertise of other volunteers may go unnoticed. The workshop's collection of bicycle repair books is seen as a good source for knowledge about older bicycles, but volunteers rarely use them. This is

partly because the books are poorly located and partly because volunteers prefer a hands-on explanation of a solution. Finally, there is a rich pool of former volunteers who have left the community, but there is no way to tap into their collective knowledge.

5. Additional findings

5.1 *Volunteer motivation factors*

On analysis, the interview data reveal a surprising and key finding beyond the elements of the knowledge audit: relatively speaking, a volunteer is valued as much for his or her dedication and reliability as for the extent of his or her knowledge of bicycle repair. This is expressed explicitly by one of the participants:

NORMALI would much rather have someone who's here, without fail, once a week for four hours, than someone who is unreliable and knew everything there is to know [about bicycle repair] (Interview D).

This statement may be explained by two facts. The workshop depends on the ongoing commitment of regular weekly volunteers to determine which days it is open. At the same time, the participants do not perceive a great need for technical knowledge sharing amongst the volunteers, since it is widely held that most clients need help only with basic repairs, and that specialized repair problems are comparatively rare. In comparison, recruiting new volunteers, drawing casual users of the workshop from the periphery of the CoP to the core, and keeping existing volunteers motivated are all key to determining the scope and sustainability of the services the workshop offers. A CoP in a volunteer community needs to sustain the altruism of its members and aid the establishment of trust throughout the community (Kolbotn, 2004). To support this, KM needs to provide a solution for the motivating factors behind volunteer participation, and not merely solve efficiency and effectiveness problems.

While not originally intended as data for the knowledge audit, the semi-structured interviews did include questions exploring the participants' reasons for volunteering. These data, as well as other statements by the participants, yield six reasons for volunteering in the workshop:

- (1) the enjoyment of socializing with people who share the same interests;
- (2) the enjoyment of bicycle riding itself or a belief in the value of bicycle culture;
- (3) the enjoyment of the work of fixing bicycles;
- (4) the opportunity to learn and develop skills;
- (5) the enjoyment of teaching others or a sense of altruism; and
- (6) the ability to control the extent of volunteer responsibilities.

These reasons are illustrated by the following quotations:

I meet other people who love bikes as much as I do (Interview C).

Mechanics in general are curious people and they like to experiment and they like to customize (Interview B).

It's fun to get greasy. You always learn new things (Interview A).

I think about myself like something in process. I'm developing, and [I guess] everybody else is feeling exactly the same (Interview B).

We're teaching people how to do the work and so then they can teach other people, they can do it themselves. We're really empowering people, and I like the feeling of that (Interview E).

I like to share my knowledge (Interview B).

This is a good way for me to do something constructive with my time to make the world a better place (Interview D).

It's also necessary to not burn our volunteers out, cause nobody's going to want to volunteer every single day so they can learn from everyone [laughs] (Interview E).

Socializing with others is mentioned by four of the five participants, and all other factors are mentioned by three participants each. This repetition of themes suggests a common culture, which is also an extension of the workshop culture of clients more generally. The motivations articulated by the participants are consistent with the literature on volunteer motivations, and also map in broad terms to the motivation factors in the Motivation-Hygiene Theory. Socializing in this context involves a mutual *recognition* of expertise; acting on one's values constitutes a kind of *achievement*; fixing bicycles, naturally, is the *work itself*; learning represents *advancement*; and altruism or teaching means an acceptance of *responsibility*.

5.2 Personal knowledge needs

Three of the identified volunteer motivation factors have the potential to be supported by KM because of their strong connection to knowledge transfer and knowledge networks: socializing, teaching, and learning. Together they comprise a third category of knowledge needs: *personal knowledge needs*. This category overlaps to some extent with the category of *technical knowledge needs*, but the categories may be distinguished when the motivations involved in a particular circumstance are considered. For instance, a volunteer may wish to identify experts within the community, but the motivation may either be to help solve problems for clients or to learn about a specialized topic for his or her own growth and interest. Accessing expert knowledge in the community and participating in its CoP become reasons to volunteer or stay involved with the workshop. The implication is that, for this organization, *personal knowledge needs* may be just as important as *operational* or *technical knowledge needs*, and an effective KM solution should address all three knowledge needs. A KM solution that addresses relevant hygiene factors, as identified in Motivation-Hygiene theory, will enable volunteers to more easily pursue their altruistic or self-actualizing motivations. Therefore, a KM solution, if possible, should also address policy and administration; supervision, perhaps by improving communication; and working conditions, perhaps by improving the organization of the workspace.

6. Recommendations

Based on the findings, the researchers propose a two part solution (Figure 1). The first part consists of a multi-faceted knowledge management system assembled from commonly available web 2.0 technologies, which have been identified as flexible and empowering user-centred tools for KM purposes (Avram, 2006). The various facets of this system will address different aspects of the *operational*, technical and *personal knowledge needs* of the workshop. The second part of the solution is a set of non-technological measures. These elements acknowledge the limited funds of the

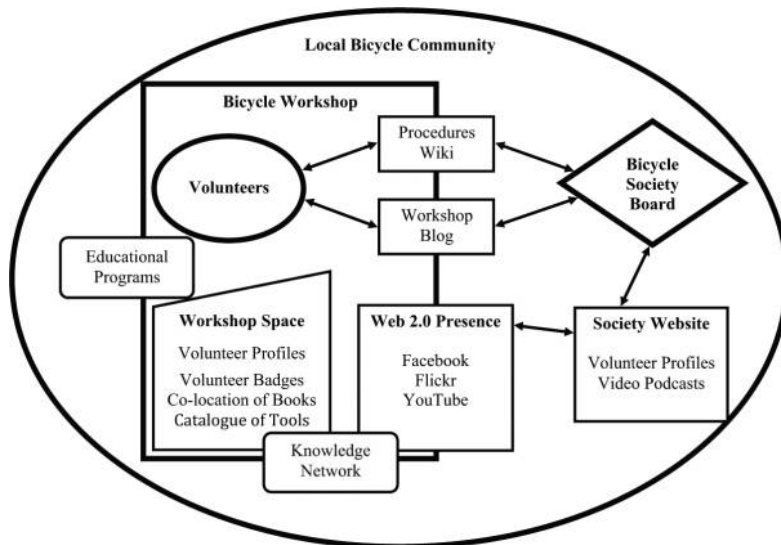


Figure 1.
Proposed KM framework
for the volunteer-based
NPO

organization, as well as a cultural preference for simple and inexpensive technologies. This preference was articulated by one participant, who said “we’re kind of anti-technology nerds”, explaining:

[...] we like new when it’s cheap and efficient (Interview C).

The technological system includes four components. First, a wiki is proposed to collaboratively develop an official set of policies and procedures. A wiki will allow knowledge of past practices to be gathered from many sources. This addresses the gap between board and volunteers that relates to oversight and training, as well as the gap between volunteers who develop responses to emerging operational challenges. It also addresses the hygiene factor of improving policy and administration.

Second, a private blog dedicated to workshop issues is proposed, both as a record of events, and as a stable communication channel for the board members and volunteers. This addresses the operational knowledge being lost in a knowledge sink via the listserv. Better communication will also address the hygiene element of supervision. A workshop blog will help break down the “silo effect” that currently isolates volunteers working on different nights of the week and leads to a lack of coordination on policies or incomplete referral of clients.

Third, a knowledge network is recommended, built using a social networking service or open-source software. A knowledge network will bridge the gap between specialized technical knowledge needs and the corresponding expertise within the volunteer community; tap into pools of unrecognized expertise; engage peripheral and former volunteers; aid in making successful referrals; and generally facilitate communication between volunteers. As a supplement to such a network, volunteer profiles could usefully be added to the society’s website. The ability to locate expertise is relevant to *personal* as well as *technical* knowledge needs, and a knowledge network will create opportunities for volunteers to socialize, learn, and share knowledge.

Finally, additional knowledge channels are proposed to aid passive and active sharing between volunteers and the wider workshop community. Channels for passive sharing might include a public blog for sharing stories, or public photo and video sharing sites, such as Flickr or YouTube. Channels for active sharing might include expanded offerings of formal repair courses, a “learn and serve” program, in which clients are enticed to volunteer in exchange for structured training in basic bicycle repair, or open-house events for volunteers to present their special projects to the public. These measures augment the existing knowledge channels within the workshop community; leverage the pool of underutilized expertise; give current volunteers a venue for their altruistic sharing; and signal to outsiders the knowledge assets of the workshop. These improvements will all contribute to strengthening and expanding the CoP of the workshop community.

In addition to these technological solutions, a parallel set of non-technological elements is proposed. They will accomplish many of the same tasks, but are quicker to implement and can pave the way for acceptance of the technological measures within the culture of the workshop. They also acknowledge the fact that the physical space remains the centre of this community. Recommendations include:

- posting volunteer profiles with photos on the walls of the workshop;
- creating volunteer business cards to aid in referrals;
- devising better identification for volunteers on the shopfloor;
- co-locating books and other information resources currently dispersed throughout the workshop;
- relocating the whiteboard and chalkboard to make better use of them as communication channels;
- moving the computer on to the shopfloor to integrate the technological solutions into the workspace; and
- compiling knowledge about specialized tools into a catalogue, indexed by name and tool function.

Taken together, the components of this proposed KM framework exploit the capacity for efficient communication and collaboration afforded by social media technologies, as well as the low-tech possibilities that arise from the physical workshop space. Face-to-face communication in the workshop is likely to remain the preferred channel for knowledge exchange; the KM framework respects this and builds supplements around it, encouraging knowledge sharing “within” the organization by removing spatial and temporal barriers between volunteers and “between” organizations (Hurley and Green, 2005) by facilitating communication with other bicycle communities.

7. Implementation

Since this research was conducted, the parent organization has taken several steps to create more engagement amongst its volunteer base and the society’s general membership. Research findings from this study have been shared with the society’s board of directors, although it is not clear what influence they may have had on the developments. The group has employed the following methods, with favourable response:

- a remodelling and reorganization of the workshop, making it more inviting and easier to use;
- a regular schedule of training courses, on both basic repair and special topics;
- two public blogs, which solicit posts from the general bicycling community;
- a monthly e-mail newsletter to members;
- an RSS feed for the society's website and blog; and
- increased use of Facebook for communication between members.

8. Conclusion and future work

In the case of this volunteer community, a KM approach is well suited for supporting volunteer motivations, such as passion for learning, teaching, socializing, and the pursuit of bicycle customization projects that require specialized knowledge. The KM system proposed here will support these *personal knowledge needs* in addition to meeting more conventional *operational* and *technical knowledge needs*. It improves internal communication channels, and is multi-faceted, allowing volunteers to choose their preferred level of participation. Furthermore, it fits within the budgetary constraints of the organization and respects the cultural preference of the community for simple technologies.

Researchers are beginning to make connections between KM, CoPs, and volunteer communities. The intersection of these areas of research certainly deserves more attention. This study has found that KM shows promise as an approach for addressing aspects of volunteer motivation in some cases. The conclusions reached in this study need to be tested as hypotheses in other volunteer communities. For instance, further research might ask whether the knowledge needs derived from volunteer motivations are as important in larger volunteer populations as they are found to be in this case. Furthermore, since the nature of the work performed by the bicycle workshop volunteers is fundamentally a kind of knowledge sharing, the suggested relationship between knowledge needs and motivating factors of volunteers should be tested across a range of NPOs to explore the extent of the connection.

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