Ontological Commitment Model for Quality Improvement Research in Community Health Domain

Wannapa Pipattanawong[1,*], Nopasit Chakpitak[2], and Worawit Janchai[2]

ABSTRACT

Community-based nursing colleges in developing countries face difficulties in achieving research quality performance due to heavy teaching workloads and a commitment to support students in practice placements. This research aimed to develop the Ontological Commitment Model for research initiative and to assert the effectiveness of this model for quality improvement in a nursing college in Chiang Mai, Thailand. Quality Improvement Research was applied and used card sorting and ontological analysis tools on the conceptual framework in order to practically transform routine work into research opportunities under a compulsory educational quality model. To gain research initiatives, keywords were extracted that related to the Baldridge Quality Model which encompasses organizational profile, leadership, strategic planning, customer focus, measurement, analysis, knowledge management, workforce focus, operation focus, and results. The research direction of the nursing college was used to extract keywords from the current Thai National Government guidelines, and the specialty or interests of knowledge workers from six participants who had no experience in research and the head of a research team who had more than three years experience were recruited in this study.

The results revealed that the Ontological Commitment Model using card sorting can help participants more rapidly achieve research initiatives than their prior experiences. The findings showed quality improvement in the research received from ontological commitment significantly helped staff to reduce their working time in routine work and to undertake research efficiently, to increase success in designing conceivable plans that integrated teaching and conducting research, and to raise their Baldridge quality scores. In particular, the benefits included an increment in the number and quality of submitted research projects and improved faculty research capacity. Increased research productivity will support the college's academic operation as a center of excellence in addiction studies.

Keywords: quality improvement research, ontological commitment, knowledge management, community health

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บทคัดย่อ

วิทยาลัยพยาบาลฐานชุมชนในประเทศกำลังพัฒนาประสบความลำบากในการทำวิจัยให้ประสบความสำเร็จด้านคุณภาพ เนื่องจากภาระงานหนักด้านการสอนและการสนับสนุนดูแลนักศึกษาในแหล่งฝึกปฏิบัติงาน การทำวิจัยครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาโมเดลข้อตกลงร่วมทางออนโทโลยี เพื่อเป็นจุดริเริ่มของการทำวิจัยและยืนยันประสิทธิภาพของโมเดลนี้ว่ามีส่วนในการปรับปรุงคุณภาพงาน ณ วิทยาลัยพยาบาลแห่งหนึ่งในจังหวัดเชียงใหม่ ประเทศไทย การวิจัยเพื่อพัฒนาคุณภาพถูกนำมาปฏิบัติ โดยใช้เครื่องมือการจัดกลุ่มข้อมูลด้วยโปสการ์ดและการวิเคราะห์ออนโทโลยีหรือภาษาที่ใช้อธิบายข้อมูลความรู้เชิงสัมพันธ์ในขอบข่ายงานตามกรอบแนวคิดของการศึกษา เพื่อปรับเปลี่ยนวิธีการปฏิบัติงานประจำให้เป็นโอกาสสำหรับการทำวิจัยภายใต้โครงสร้างคุณภาพที่จำเป็นต้องดำเนินการเพื่อการศึกษา ตลอดจนเพื่อให้เกิดการริเริ่มการทำวิจัย โดยคำสำคัญที่เกี่ยวข้องกับรูปแบบคุณภาพการศึกษาของบัลดริจซึ่งนำมาประยุกต์ ใช้ในครั้งนี้ได้ถูกสกัดออกมาประกอบด้วย โครงร่างขององค์กร การนำองค์กร การวางแผนกลยุทธ์ การให้ความสำคัญต่อลูกค้า การวัดการวิเคราะห์และการจัดการความรู้ การให้ความสำคัญต่อบุคคลากรหรือคนทำงาน การให้ความสำคัญต่อกระบวนการปฏิบัติงานและผลลัพธ์ โดยทิศทางของการวิจัยในวิทยาลัยพยาบาลถูกนำเสนอประกอบด้วยคำสำคัญที่ได้จากทิศทางการวิจัยของรัฐบาลไทยในปัจจุบันและจากความเชี่ยวชาญเฉพาะทางหรือความสนใจของผู้เข้าร่วมงานวิจัยทั้งสิ้นจำนวน 6 คน ซึ่งเป็นผู้ที่ไม่มีประสบการณ์ในการเป็นหัวหน้าทีมวิจัยในองค์กรมามากกว่า 3 ปี รวมด้วย

ผลการวิจัยพบว่า โมเดลข้อตกลงร่วมทางออนโทโลยี โดยใช้การจัดกลุ่มข้อมูลด้วยบัตรคำสามารถช่วยให้นักวิจัยผู้เข้าร่วมการศึกษาครั้งนี้ ริเริ่มการทำงานวิจัยได้รวดเร็วกว่าประสบการณ์การดำเนินงานวิจัยในอดีตที่ผ่านมา ข้อค้นพบครั้งนี้แสดงให้เห็นว่า การวิจัยเพื่อพัฒนาคุณภาพที่ได้จากข้อตกลงร่วมทางออนโทโลยีมีนัยสำคัญที่ช่วยให้เจ้าหน้าที่ลดเวลาในการทำงานประจำและการทำวิจัยได้อย่างมีประสิทธิภาพ เพิ่มความสำเร็จในการสามารถออกแบบแผนที่บูรณาการการสอนและการวิจัยเข้าด้วยกันได้ และยังทำให้คะแนนด้านคุณภาพของบัลดริจเพิ่มสูงขึ้น โดยเฉพาะอย่างยิ่งผลประโยชน์ที่ได้รับซึ่งรวมถึงการเพิ่มขึ้นของปริมาณและคุณภาพของโครงการวิจัย ตลอดพัฒนาขีดความสามารถของคณะผู้ร่วมงานวิจัย ด้วย ซึ่งผลผลิตงานวิจัยที่เพิ่มขึ้นในการศึกษาครั้งนี้ยังช่วยสนับสนุนการดำเนินงานด้านวิชาการของวิทยาลัยในฐานะของการเป็นศูนย์ความเป็นเลิศด้านการศึกษาสิ่งเสพติดด้วย

คำสำคัญ: การวิจัยพัฒนาคุณภาพ ข้อตกลงร่วมทางออนโทโลยี การจัดการความรู้ สุขภาพชุมชน

INTRODUCTION

The Boromarajonani College of Nursing, Chiang Mai (BCNC), is one of 29 Community-based Nursing Colleges (CBNC) under the Jurisdiction of the Praboromarajchanok Institute for Health Workforce Development (PBRI), Ministry of Public Health, Thailand. BCNC is a Higher Education Institute which offers the Bachelors Degree of Nursing Science, and the Certificate in Emergency Medical Technician-Intermediate. Its mission is to produce nurses and emergency medical technicians to support the community health service system in order to improve well-being in communities.

In order to ensure greater quality and achievements, BCNC uses Quality Assurance (QA) goals to promulgate educational quality. According to the Office of Higher Education Commission (2010) for colleges, universities and other educational institutes in Thailand, there are four primary areas on which all health care institutes at the higher education level in Thailand should focus:

1) to produce and develop health personnel; 2) to conduct research and maintain creative productivity; 3) to provide academic services; and 4) to play a role in art and culture preservation.

Conducting research is an important area that is compatible with the BCNC goal to be "The leading institute of the country focusing on general nursing and public health for developing wisdom-based community by the year 2013" (BCNC, 2010). However, the results from internal quality assessment showed that BCNC cannot reach the research goals to the QA standard. From 2007 to 2009, only a small amount of the research (12.81%) met research objectives. This fell short of the Office for National Education Standard Quality Assessment (ONESQA: a public organization): and Thai Nursing and Midwifery Council standard of at least 20 percent (Pipattanawong, Yodmongkon & Chakpitak, 2011).

CBNC in developing countries needs a collaborative partnership approach to community health research that is equitable in all aspects of the research process among organizational representatives, community members, and researchers (Israel, Schulz, Parker, & Becker, 2001; US Department of Health and Human Services, 2003) as also applies to BCNC. Previously, 34.6 percent of BCNC research was conducted in the community but only one-third of this was definite community based research whilst classroom research and other types of research represented 54.9 and 11.5 percent, respectively. The level of BCNC research overhead articles per staff member per year was 0.13 (Research Steering Committee. 2013), while the baseline national standard of all Nursing Colleges under the authority of PBRI achieved an average of 0.70 articles (Kaewjiboon, 1998). Moreover, 96.15 percent of BCNC instructors did not reach their goals in academic paper writing and publication.

To investigate the root cause of the problem, preliminary research at BCNC was conducted. The results corroborated evidence of staff objections, suggesting that: 1) workload; 2) a lack of skills and confidence; and 3) a lack of research opportunity were factors preventing research being conducted at BCNC. Moreover, these factors were found at a moderate level in a satisfaction survey of BCNC research management (Pipattanawong et al., 2011)

According to this information, knowledge workers at BCNC mostly used their time in teaching and learning, and much less in research. Many revealed they had a lack of research skills and could not see research opportunities. Therefore, it was suggested that BCNC focus on Quality Improvement Research (QIR) or Routine to Research (R2R) in Thailand, so that teachers would be able to transform quality routine work into research opportunities and maintain academic productivity at the same time. However, the direction of conducting research should be aligned with BCNC's vision, mission, values, goals, and identity, and also should be able to ensure a high-performance organization. Moreover, BCNC should create its research identity by leveraging R2R and applying knowledge management as a framework to approach and enable teaching staff in this CBNC to develop a set of practices to collect information and share what they know, leading to action (such as conducting research) that improves quality services and outcomes (Kidwell, Vander Lande, & Johnson, 2000).

Therefore, the objectives of this study were to:

1) develop the Ontology Commitment Model for improving BCNC research capacity,

2) assert the effectiveness of a commitment to ontology in the community health domain.

Conceptual framework and methodology

Due to the challenge facing BCNC to initiate research, this study applied the methodologies of knowledge elicitation in order to create knowledge from a variety of sources explicit in the form of ontologies. Despite this, the methodology can facilitate BCNC to effectively access knowledge to initiate new research topics.

Figure 1 presents a conceptual framework illustrating the important areas that the BCNC research manager should be concerned with to improve knowledge workers' research capacity: 1) the Education Criteria for Performance Excellence (EdPEx); 2) BCNC's direction; 3) knowledge workers' interests; and 4) community requirements. However, this study looked at only one part of a whole research action approach, focusing only on how to improve BCNC's capacity to identify research opportunities effectively, using the development of ontologically explicit formal specifications of the terms in the domain and the relations among them (Gruber, 1993).

Group 1 represents the Education Criteria for Performance Excellence (EdPEx) which provide a system perspective for understanding performance management. They reflect validated, leading-edge management practices against which an organization can measure itself (Eggleston, Gibbons, & Vera, 2007). With their acceptance nationally and internationally as the model for performance excellence, these criteria have been applied as the template of the Thailand Quality Award (TQA), Thailand Quality Control (TQC), and for the Public Sector Management Quality Award (PMQA) in Thailand. EdPEx places emphasis on systematic organizational management and international approval to help the education system develop by leaps and bounds and to be sustainable (NIST, 2011). This process encompasses an organizational profile and seven key areas of: 1) leadership, 2) strategic planning, 3) customer focus, 4) measurement, analysis, and knowledge management, 5) workforce focus, 6) operations focus, and 7) results.

Group 2 represents BCNC's direction or vision that they are passionate to train, educate, and enhance the capacity and competency of nurses and emergency medical technicians to improve well-being in the community.

Group 3 represents the interested domain and the specialty of BCNC's knowledge workers.

Group 4 represents opportunities from community requirements congruent with BCNC's identity to serve the community or stakeholders for example alumni, health personnel, and local administrative organizations. It is also aligned with the PBRI mission focusing on community-based research to achieve community sustainability.

Figure 2 shows an overview of the five methodological steps in this research.

A pre-step of defining the objectives of this study was undertaken to create mutual understanding, to clarify research capacity, and to inform the inclusion criteria to select representative samples among BCNC knowledge workers. The first participatory meeting was held with:

1) three of the BCNC management team

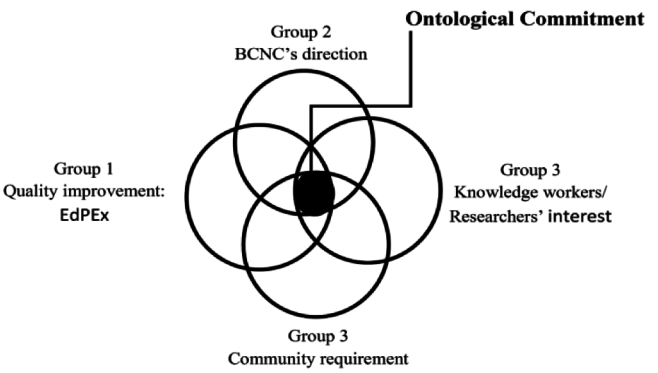

Figure 1 Conceptual framework illustrating the important areas in opportunities for the improvement of Community-based Nursing College research capacity
(EdPEx = Education Criteria for Performance Excellence)

and research management committee to share purpose and direction for improving the quality of the organization.

2) 34 BCNC staff (knowledge workers) from six excellence centers/departments who met the inclusive criteria and were contacted by the researcher to join in the first meeting and were willing to participate in this study. The selection criteria were:

a) novice defined as one who has taken a role as a nursing instructor for at least two years and has finished at least a bachelor degree and was willing to participate in this study.

b) a person who has no experience in research whilst working at BCNC for more than three years.

c) a person who has experience as a co-researcher, or has been a leader of any completed research at least once in the past three years (2009-2011) and was allowed to participate by a chief of department or unit in his/ her current work area.

Hence, purposive sampling was applied in this study in order to include a sample that suited the inclusion criteria. After the research objectives were defined, six participants from each cluster of six excellence centers or departments who met the inclusion criteria and were willing to participate in this study were selected by researcher and the chief of each cluster. They were asked to complete the signed consent form, and were given access to the requested documents relevant to this study. Appointments for focus group discussion and interviews were made to assess their interests or experience as they related to the research direction focusing on harm prevention, which was the community-based issue for this pilot study.

Following definition of the objective, the first step of knowledge conceptualization was conducted. According to Kayed, Hirzallah, Al Shalabi, & Najjar (2008), conceptualization consists of extracting terms and then categorizing them in a conceptual model. The knowledge-elicitation technique was applied to extract terms. It used different resources to collect the terms, such as experts, interviews, books, academic papers, documents from the One District One Project (ODOP) under the Chiang Mai Provincial Public Health Office Ministry of Public Health, Thailand (Subcommittee on Primary Care Service Plan in Chiang Mai District Health System Program, 2012), and local community health needs extracted from public hearings (Subcommittee on Donkaew Sub-district Health Assembly, 2011; Donkaew Sub-district Administrative Organization, 2011), among others. The terms were categorized into groups and were sent back to the experts consisting of professionals and stakeholders in each area for verification.

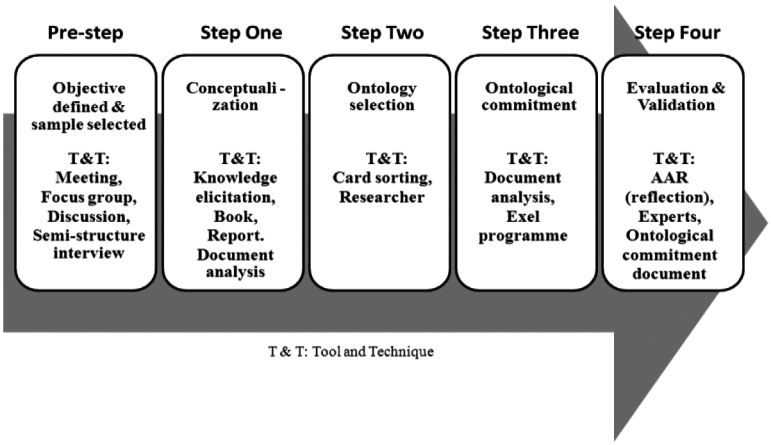

Figure 2 Overview of the methodological steps following in this research

In order to select ontology in step two or create the information architecture of what goes where, a card sorting technique was used to find the research initiative topic that aligned with the BCNC vision, the EdPEx criteria, knowledge workers' interests, and community needs. Before sorting the cards, some preparatory steps were required (Robertson, 2001) as follows: 1) ensure that each term is as clear and unambiguous as possible; 2) include all the items needed for to categorization; 3) shuffle or randomize the cards prior to each participant session; 4) script a set of instructions so that all participants have the same understanding of the process; 5) leave participants alone while they are sorting the cards to avoid placing them under unnecessary time pressure; and 6) provide additional blank cards for people to write group names.

Following the ontology selection in step two, ontology commitment was determined in step three. This step provided an account of key specific words for new research topics that better served the relationships to the four main important areas of BCNC concern—namely, 1) BCNC's direction, 2) EdPEx criteria, 3) knowledge workers' interest, and 4) community requirements.

Evaluation of the Ontological Commitment Model was finally done in step four using an after-action review from the participants and team-based discussion from the research management executives and research advisory committees to prove the validation of the model. The quality assurance assessment of the OHEC and the ONESQA were planned to be applied to promote improvement of the research quality.

RESULTS

Referring to the conceptual framework, BCNC research management needed to fulfill four areas: 1) EdPEx criteira, 2) BCNC's direction, 3) knowledge workers' interest, and 4) community requirements. Despite this, ontologies that represented the knowledge in each domain needed to be defined. A set of terms was specified and conceptualized into four groups according to the areas in which BCNC needed to be fulfilled.

Group 1: Ontology representing the EdPEx quality Model

In order to define ontologies related to the quality model; the BCNC management team and research management committee need shared direction, alignment, and commitment to move further in the right direction. Therefore, SIPOC (Garvin, 2000)—an acronym that consists of the five elements: suppliers, inputs, process, outputs, and customers—was applied to help the team reflect on the processes in the value chain and to share commitment to the organization in order to improve the quality of the organization.

Figure 3 represents the use of SIPOC diagrams (Garvin, 2000) to map knowledge that BCNC management team reflected.

Referring to SIPOC, the results show that the BCNC services life cycle consists of: teaching, research, academic service, and harm prevention. Knowledge of each process was coded—for example ST01 where S stand for the type of process and can be I, P, O, or C (S = Supplier, I = Input, P = Process, O = Output, C = Customer); T stands for BCNC's professional area and can be R, A, or S

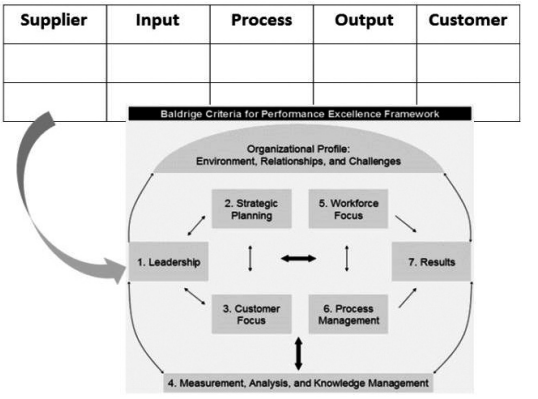

Figure 3 Representation of the use of SIPOC (suppliers, inputs, process, outputs, and customers) diagrams to map knowledge
Source: Adapted from Garvin, 2000

(T = Teaching, R = Research, A = Academic service, S = Harm prevention in school); and 01 is the sequential number attributed to the key word of one given knowledge Set (01, 02, 03,…).

Ontologies from SIPOC diagrams can link to the value of the Malcolm Baldrige EdPEx as group No. 1, as shown in Figure 4. Ontologies were coded —for example G1-OP01, where G1 stands for the group number and can be G2, G3, or G4 (G1 = Baldrige Quality Model, G2 = BCNC's direction, G 3 = Knowledge worker's interest, G4 = Community requirement); OP stands for organizational profile; and 01 is the sequential number attributed to the key word of one given knowledge set (01, 02, 03,…).

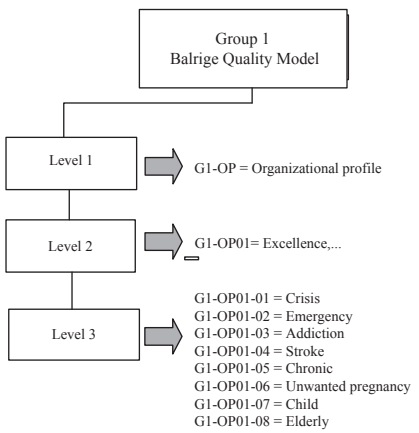

Figure 4 Group 1: Example of ontologies from SIPOC (suppliers, inputs, process, outputs, and customers) diagrams linked to Baldrige quality

Group 2: Ontologies representing BCNC's direction

Ontologies related to BCNC's research direction were specified by conducting a brainstorming workshop with the research management committee. All participants must have a shared vision and value for directing research management of BCNC. BCNC's vision, mission, goals, direction, and strategy were topics for discussion, so that ontologies were built to represent the right concept. Then, they were transformed onto a datasheet which recorded their group numbers and level. According to Figure 5, ontologies were coded—for example G2 -01where G2 stands for the group number and can be G1, G3, or G4 (G1 = Baldridge Quality Model, G 2 = BCNC's direction, G3 = Knowledge worker's interest, G4 = Community requirement) and 01 is the sequential number attributed to the key word of one given knowledge set (01, 02, 03, …).

Group 3: Ontologies representing knowledge workers' interest/specialty

Ontologies related to knowledge workers' interest/specialty were specified by conducting a brainstorming workshop with six BCNC staff who met the criteria and were willing to participate in this study. Two of the participants held bachelor degrees in nursing, two held master's degrees in professional development, and the final two held master's degrees in community health and psychiatric nursing. It was found that their education and expertise had highly influenced their domains of

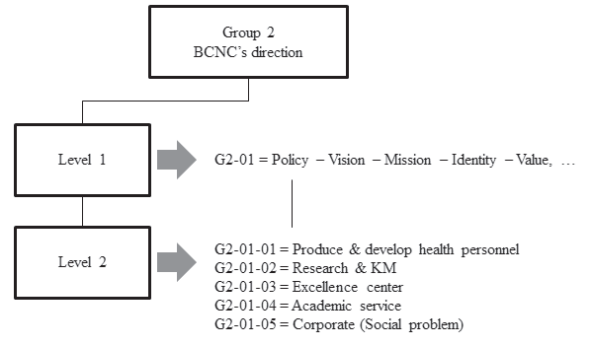

Figure 5 Group 2: Example of ontologies representing BCNC's direction

interest of health promotion, elderly nursing, and psychiatric nursing, addiction in adolescence, addiction members, alcohol prevention, game addiction, etc. According to Figure 6, ontologies were coded—for example KW1-01, where KW stands for knowledge worker and can be KW1, KW 2, …, KW6 (KW1 = Knowledge worker 1, KW2 = Knowledge worker 2, …, KW6 = Knowledge worker 6), 01 is the sequential number attributed to the key word of one given knowledge Set (01, 02, 03, …) and T stand for BCNC's professional area and can be R, A, or S (T = Teaching, R = Research, A = Academic service, S = Harm prevention in school).

Group 4: Ontology representing community's requirements

Ontologies related to the community's requirement were specified by knowledge capture methods and document analysis. The key important terms were extracted and sent to an expert from the Ministry of Public Health, Chiang Mai province, Thailand, for verification. Ontologies of this group provided key terms that represent the areas of concern for communities, such as health problems, disease, prevention methods, and solutions to problems. According to Figure 7, ontologies were coded—for example NC01, where NC stands for the type disease and can be CD, OT, SO, or SE (NC =

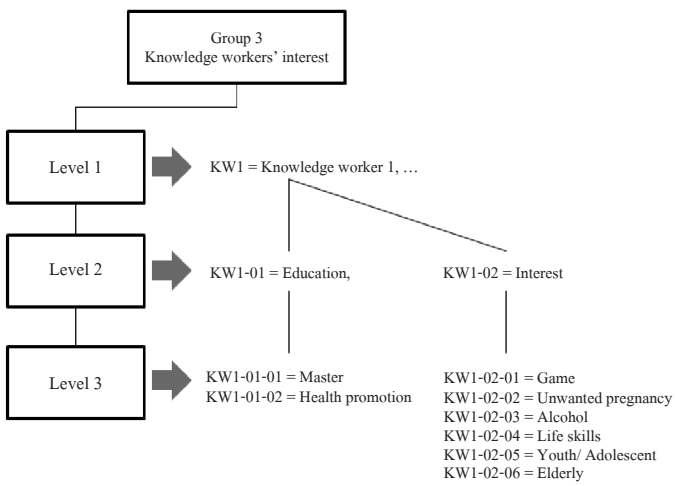

Figure 6 Group 3: Ontologies representing knowledge workers' interest/specialty

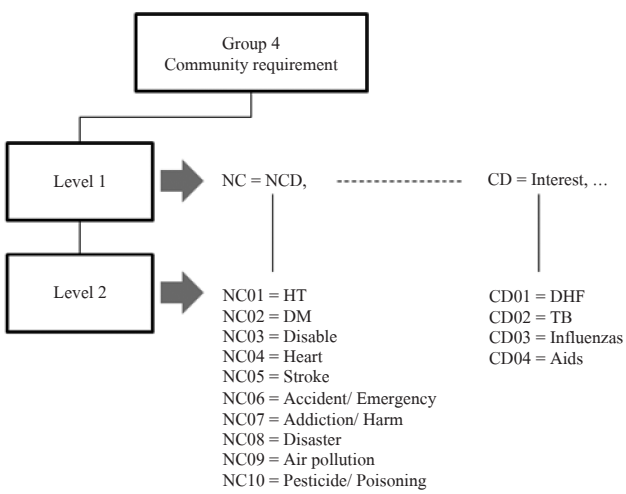

Figure 7 Group 4: Examples of ontologies representing community's requirement

Non-communicable disease, CD = Communicable disease, OT = Others, SO = Solutions, SE = Setting), and 01 is the sequential number attributed to the key word of one given knowledge set (01, 02, 03, …).

The ontologies of groups 1–4 were written on cards and given to the six participants to select. The selection process was done in three rounds within a time frame in order to find the key words that best described opportunities for new research topics. The results showed that the six participants could effectively initiate 2–4 research topics from ontology selection using the card sorting technique. The ontologies selected by participants represented their interested domains, which related to games (20.51%), adolescence (15.38%), and unwanted pregnancy (10.26%), respectively.

Figure 8 shows the conceptualization of ontologies that represent the four key concern areas of BCNC. Ontology in each area represents explicit knowledge of the organization. However it is full of technical terminologies, referring to specific meanings used among groups of experts. This can lead to a distraction from organizational direction. Therefore, ontology alignment is essential to build an integrated corporate knowledge for the organization, so that knowledge workers whose expertise is in different domains can share a mutual understanding and vision to achieve organizational targets.

Card sorting is considered as a tool for facilitating knowledge workers to extract their tacit knowledge, when it is applied under the condition of participants' willingness. Whenever knowledge workers select cards from different groups, a shared conceptualization of an interested domain is then created. Sharing reflects the notion that an ontology captures consensual knowledge (Studer, Benjamins, & Fensel, 1998), and it is an ontological commitment of an organization.

In this study, six participants produced a shared ontology, which related to games (20.51%), adolescence (15.38%), and unwanted pregnancy (10.26%). respectively. This aligning ontology becomes the ontological commitment to improve the quality of BCNC in terms of research capacity. The six participants took only 10–15 minutes to initiate 2–4 research topics per person, compared to 2 weeks to 2 months in previous exercises. Moreover, the research will definitely align with the quality improvement model, BCNC's direction, and community requirements.

DISCUSSION AND CONCLUSION

Due to the difficulty in achieving research quality performance in Community-based Nursing Colleges, the Ontology Commitment Model was created to improve BCNC research quality performance. The Ontology Commitment Model is novel in community-based higher education institutes and starts with clarifying the organizational direction and sharing a commitment for quality improvement research under the frame of the SIPOC value chain diagram. At this stage, leaders of BCNC play an important role in participating in the discussion. As Senge (1990) mentioned, leaders are designers who design knowledge management tools, make decisions concerning the governing ideas of vision and core values, and push the organization in the same direction. They play a key role in the implementation of the model. This is aligned with the study results of Ahmed, Beck, Muarana, and Newton (2004), who mentioned that leadership is very important in an organization to expand its current effort and the definition of the research direction before being included in the organizational research construction and being an integral part of the academic culture.

The Ontology Commitment Model can enhance the capacity of BCNC's research management and sustain the transformation of routine work into research opportunities under a compulsory educational quality model. The Ontology Commitment Model can benefit many different areas:

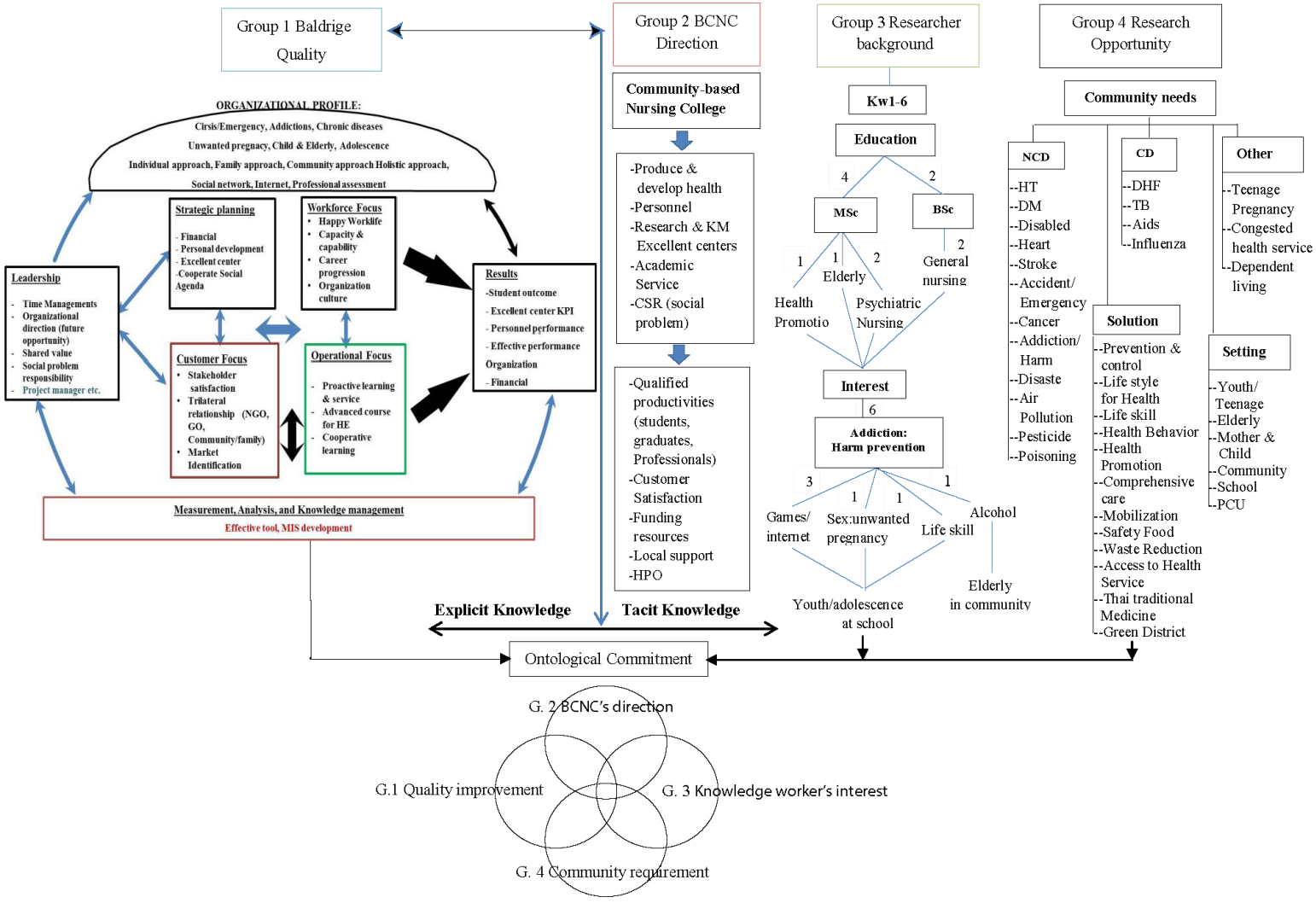

Figure 8 Conceptualization of ontologies that represent four key concern areas of BCNC

1) It can benefit the five excellence centers of BCNC—the addiction center, stroke center, emergency center, unwanted pregnancy center, and the child and elderly center—to initiate new research that serves the community's requirements and improves educational quality according to the standard of the Office for National Education Standards and Quality Assessment (ONESQA).

2) It generates academic advantage to BCNC instructors to create new research topics that align with organizational direction, the EdPEx criteria, researcher's expertise, and community requirements.

3) It also serves the heath needs of the local community.

However, there are limitations to using the Ontology Commitment Model, as it requires context differentiation related to the organizational direction, and individuals' backgrounds, expertise, and interests. Therefore, other organizations who are interested in applying this model should consider these mentioned factors as well.

The recommendations from this study are: 1) the CBNC policy makers should set this effective Ontological Commitment Model as an organization policy and a key performance agreement between knowledge workers and the executive committee to improve their research capacity and each individual' s evaluation; 2) this model should be applied and extended to cover other excellence centers in the organization; 3) in addition, the knowledge workers should be encouraged to follow the steps of research initiation to develop their routine quality and improve their professional and student development further.

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