

# Framework for knowledge asset management in community projects in Higher Education Institutions

Hanlie Smuts <sup>[0000-0001-7120-7787]</sup>, Martina Jordaan <sup>[0000-0003-0110-6600]</sup>

Department of Informatics,  
University of Pretoria, Pretoria, South Africa  
hanlie.smuts@up.ac.za, martina.jordaan@up.ac.za

**Abstract.** Innovation in education encourages stakeholders to explore and apply different ways of looking at problems and solving them. Large-scale community projects (LSCPs) in a higher education institution (HEI), provide an ideal environment for combining curriculum outcomes, education innovation, real-world engagement and knowledge assets. However, current research that focuses on knowledge asset management in innovative learning is limited, and this study aims to contribute a holistic approach for managing knowledge assets in this context. In this study, we designed a knowledge asset management framework for LSCPs in higher education taking cognisance of innovative educational model characteristics. We applied the framework by mapping it to a community project module from an HEI using the elements of the framework as a guide. By using the knowledge asset management framework for LSCPs in higher education, an HEI can ensure that their community module enables strong support to the community, that students' knowledge and skills are enhanced and that all new knowledge assets created during the project delivery, are captured and stored using innovative technology sets.

**Keywords:** Knowledge Asset Management, Innovative Education, Knowledge Exchange, Community Projects.

## 1. Introduction

The delivery of high quality, efficient and innovative education in increasingly complex systems, is a key requirement [1]. Furthermore, the development of innovative technologies also contribute to the increasing complexity, emphasising the requirement to focus on more than own knowledge. Focus should also be on; adapting to organisational requirements, to operate and manage information, to make decisions and to learn lifelong [1, 2]. Innovative learning may be achieved through pedagogical innovation (change teaching style), scientific and methodological innovation (introduce innovative course content), and education and technological innovation (application of improved learning technologies) [1].

Education which connects the student's real life and prior knowledge, has the potential to create meaningful learning environments in which they could develop their creativity, problem solving and innovation skills [3]. One opportunity that combines a focus on curriculum outcomes, knowledge assets, real-world engagement and learning, is HEI facilitated community-based projects [4].

Community-based projects are regarded as a high-impact practice that improves student engagement, pointing to interaction and commitment among the community project parties [5]. LSCPs combine academic study with community service by having students voluntarily become part of community projects, focusing on achieving academic goals for students and fostering meaningful, beneficial outcomes for communities [2, 6].

However, scholars identified several problems with regard to academic learning programmes in LSCPs. Problems include the transfer of homogenous, university-based knowledge only, a lack of academic development measurement, a low adoption of deeper learning approaches such as project-based learning activities, poor knowledge asset management and limited examination of the impact of reflection in community based programmes [2, 6-8]. In addition, Bedford [4] presents several challenges that universities encounter when establishing and managing knowledge assets in an academic program.

This study aims to contribute to innovation in education by considering a novel approach to managing knowledge throughout the community project execution [9, 10]. It also aims to investigate the knowledge asset management mechanism that inform knowledge-based flows in a community module, optimising outputs and fostering innovation. Therefore, the primary research question that this study aims to address is: *“How can knowledge assets created in a large-scale community project in an HEI be managed innovatively?”*. The aim of such a framework is to outline the guiding principles and key structural elements required to manage knowledge assets created during LSCPs contributing to all aspects of innovative learning [1]. Such knowledge assets also provide a platform for continuous value add and knowledge transfer from community project to project in the context of a community partner as a new project team may build on, and enhance, previous community project work.

Section 2 of this paper provides the background to the study and presents the role players, engagement and knowledge transfer play as part of community learning. The approach to this study is discussed in Section 3, while Section 4 provides an overview of the knowledge asset management framework. Section 5 maps a community-based academic module to the knowledge asset management framework to establish the proposed framework’s suitability as an innovative tool. Section 6 discusses the findings and concludes the paper.

## **2. Background**

The main aspects of innovative development in HEIs include; staff development, social development, educational process development, economic development, technological development and organisational development [11]. Furthermore, educational innovation is purpose-orientated and includes system, process or implementation methods that are significantly different from established practices [1, 11]. Learning in community-based projects is defined as “an educational methodology that combines community-based experiences with explicit academic learning objectives and deliberate reflection” [12 : i]. The success of community learning modules in HEIs depends on multiple factors and inter-relationships, including the HEI context, the student group involved, the community involved, existing knowledge assets and the desired learning outcomes [12-14]. It is also

recognised that community engagement is a complex, multi-faceted process that involves relationships in, for and with communities [3, 14].

In the following sections, characteristics of innovative educational models, LSCPs in HEIs and knowledge asset management in the context of community projects, are considered.

### 2.1 Characteristics of innovative educational models

In the world of education, innovation comes in many forms and encourages lecturers and students to explore and use different tools to uncover new approaches. It involves a different way of looking at problems and solving them [15]. Characteristics of innovative educational models include multiple aspects. *Context* points to combining educational, scientific and practical aspects of student activities into real-world scenarios. *Imitation* refers to the application of games and simulation in learning, while *modular* includes structuring educational material content to maximise mastering. Students are encouraged to conduct independent knowledge searches through *problematization* of learning material where differentiated tasks encourage students to apply different abilities to *acquire knowledge* [1, 11, 15].

Community projects in an HEI aim to increase knowledge, while providing a service to the wider community from a holistic perspective [16, 17]. The role of an HEI in this instance includes the development of cross-boundary knowledge and requires new approaches to knowledge generation and transmission as students must be able to apply knowledge in- and outside academic structures [18, 19].

In this section, we reflected on educational innovation and the role of community based projects. Hence, the next section presents the considerations related to knowledge conversion in the context of LSCPs in an HEI.

### 2.2 Knowledge asset management

Knowledge can be categorised as either explicit (has been expressed) or implicit (deeply embedded knowledge that is less tangible) [20, 21]. Tacit knowledge, as a dimension of implicit knowledge, is personal and context-specific, and therefore hard to articulate and formalise [21-23]. In order to act on information, students need to internalise the information and achieve this by progressing through knowledge conversion processes namely socialisation, externalisation, combination or internalisation. *Socialisation* ensures that knowledge is acquired, after which *externalisation* enables students to express their tacit knowledge (mental models and know-how) [24, 25]. *Combination* is the process of integrating concepts, while *internalisation* is closely related to learning-by-doing, or experiential learning. This process of knowledge conversion ensures that knowledge is advanced through practice, imitation, observation and guidance [19, 24, 26]. Consequently, community based module design should include clearly delineated processes of knowledge conversion, reflection and evaluation, and the management of knowledge assets [5, 27].

The approach of this paper is based on the notion of ensuring that equal focus is given to the knowledge assets that are created during the interaction, as well as learning innovation characteristic alignment. Before the framework for knowledge

asset management for LSCPs in an HEI is presented, the research approach is discussed in the next section.

### 3. Research approach

The objective of this paper was to establish a framework for innovatively managing knowledge assets created in a large-scale community project in an HEI. We followed an educational design research approach that can be defined as “a genre of research in which the iterative development of solutions to practical and complex educational problems also provides the context for empirical investigation, which yields theoretical understanding that can inform the work of others” [28 : 7]. Educational design research is predominantly concerned with developing practical knowledge that aims to improve educational practices [28, 29]. Educational design research yields theories and practical educational interventions as its outcomes [30] and covers five characteristics [29]: theoretically orientated, interventionist, collaborative, responsively grounded and iterative [28]. *Theoretically orientated* refers to the application of scientific understanding to frame the research and shape the design of a solution to a real problem. The *interventionist* nature of educational design research strives to positively affect practice, bringing about transformation through the design and use of solutions to real problems. Educational design research requires *collaboration* among a range of role players who are connected to the problem being addressed. It also requires *responsively grounded* points to participant expertise, literature and field testing of the outcomes of educational design research that is structured to discover and explore the complex realities of teaching and learning contexts, and respond accordingly. The insights and interventions of educational design research evolve over time through multiple *iterations* of investigation, development, testing and refinement, illustrating the iterative nature of the approach [28].

The study was conducted at an HEI in South Africa that offers a compulsory undergraduate community-based project module. In order to evaluate the knowledge asset management framework for HEIs designed from the literature, the proposed framework was mapped to the large-scale community module, corroborating the comprehensive nature of the framework elements.

In the next section, the design of the knowledge asset management framework for LSCPs in HEIs is discussed in detail.

### 4. Framework for knowledge asset management in large-scale community projects

The purpose of this study is to present a knowledge asset management framework for LSCPs in an HEI by considering the characteristics of innovative educational models. Three role players are important in the context of an HEI as shown in Figure 1: the faculty and the lecturer of the community module, the student, and the community partners [14]. From a *faculty and lecturer perspective*, these roles include the definition of the learning outcomes for the community module, the number of credits allocated to the module and the structuring of the community

learning interaction [14, 31]. The *student* needs to complete the community learning module as part of their degree and learn new skills and competencies. The *community partner* provides service opportunities, mentorship and enables active participation with community life. In addition, each of these role-players have their own knowledge assets [14, 32]. From a *faculty perspective*, the *lecturer* has particular knowledge assets around the module design, the learning outcomes, community partner engagement, teaching and learning, etc. *Community partners* hold knowledge about their community, service requirements, skills required, etc. A *student* enters the community-based module with existing knowledge that is reframed into a new understanding and -knowledge through experiential learning enriched by the knowledge exchange from the lecturer and community partners [5, 13].

In a community-based project, a project team is established with each of these role-players forming part of the team (centre of Figure 1). Among these role-players, knowledge conversion takes place: between the lecturer, who is focused on the module's learning outcomes, and the student, the knowledge conversion process of *internalisation* is relevant [24]. The student enters the community project with prior knowledge and knowledge about the programme is shared with the student. The *internalisation* knowledge conversion process ensures the extraction of knowledge from the community project module and enables the subsequent filtering of knowledge, ensuring greater relevance and appropriateness of knowledge to the student. At this stage, the enhanced knowledge is theory-based [33]. With this theory, the student embarks on a community project, where the theoretical knowledge is converted to capability through the *socialisation* knowledge conversion process [24]. *Socialisation* is enabled through the experiential nature of the community project and exposure to a real-world problem setting. Once the student has completed the community learning process and ultimately the community module, the *externalisation* knowledge conversion process enables the student to reflect on the learning that took place [24]. *Combination* assists the student in creating new explicit knowledge based on the experience [24].

In the centre of Figure 1 and as part of new knowledge created by the community-based project team through a knowledge conversion process socialisation, externalisation, combination and internalisation, new knowledge assets are created that must be assimilated, recorded, and stored. This new knowledge must also be made available to new project teams that may enhance or complete work started by a previous project team. Storing of the new knowledge assets create a knowledge repository for community project teams to learn from, potentially shortening the kick off phase of a community project as enhanced prior learning is achieved.

Each knowledge conversion process is also associated with new knowledge assets denoted by an arrow in Figure 1. New knowledge may be created by one of the knowledge conversion processes as progressing through all four processes is not a requirement to create new knowledge assets. Arrows between the role players and the knowledge conversion process taking place during the implementation of the community project, indicate that each role player interact with the entire system of knowledge asset creation during the execution of the community project.

In order to learn from practice, as guided by our research approach, we proceeded to map a community-based module at an HEI in South Africa to the proposed framework. The mapping and implications are discussed in detail in the next section.

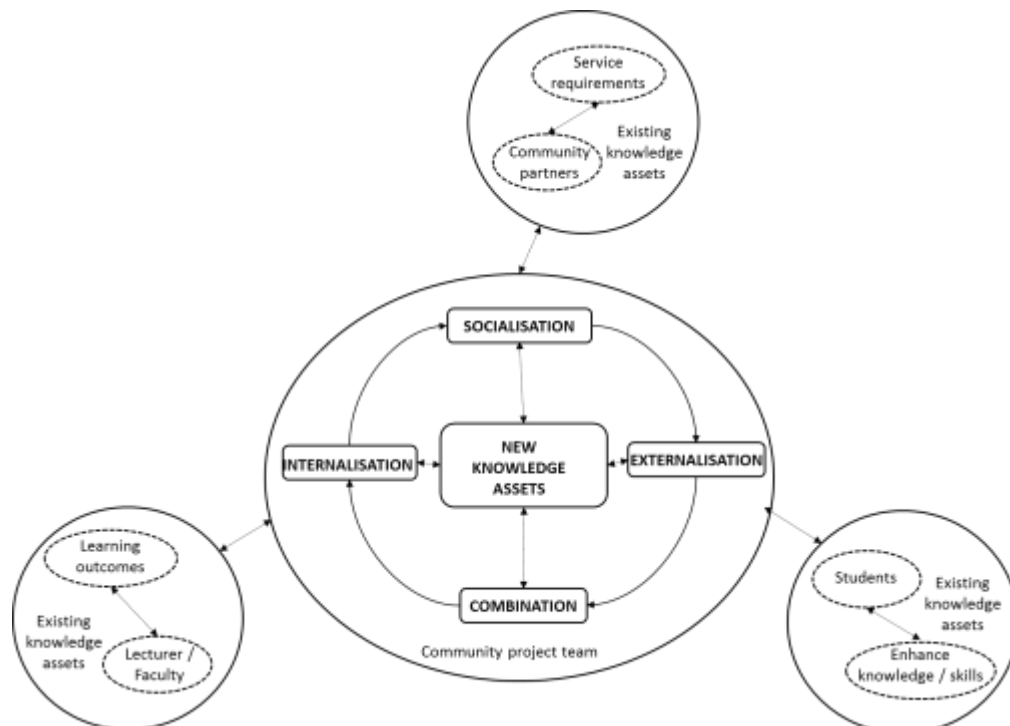


Figure 1: A knowledge asset management framework for large-scale community projects in HEIs

## 5. Mapping of knowledge assets in a large scale community project

An HEI in South Africa presents a compulsory free-standing undergraduate module: Joint Community-based Project (JCP). The decision to create the independent course was motivated by the need to integrate community service and learning projects, including humanitarian engineering projects, in the curriculum of all the undergraduate programmes in the particular Faculty in addition to adhering to the University's strategic social responsibility goal [34]. The module's primary objectives include benefit realisation for a relevant section of society by exposing groups of students to real-life challenges. Students do at least 40 hours of fieldwork, after which they reflect on their experiences through various assignments, including a final presentation, video and report.

It is a macro community engagement course due to the substantial number of enrolled students and projects. Since 2011, more than 1 600 students have registered for the course annually, with an average completion rate of 95%. Generally, the students work in 500 groups each year to help more than 370 different community partners. Implementing this large number of projects successfully requires a unique

teaching and assessment model, sustainable community partnerships, robust logistical and financial processes, effective communication and passionate administrative and academic staff.

In order to evaluate the proposed knowledge asset management framework for LSCPs, we considered the individual components of the proposed framework, and the scope and outcome achieved from the class of 2018. In 2018, students enrolled from three different schools at the HEI: some 979 students came from the School of Engineering (10 different degrees), 299 from the School of Information Technology (9 different degrees) and 288 from the School for the Built Environment (6 different degrees), yielding a total of 1566 students. Community projects in 2018 included 235 community partners and 411 projects were completed. Students worked on projects in 5 countries in 2018 and fundamental aspects, including how to identify a project, the steps to complete the project and the assignments that need to be done to complete the module successfully, were included. A small budget of ZAR400 was awarded per student and students were allowed to raise additional funds that are required to complete their project.

We analysed the 411 community project artefacts (project reports, community partner evaluation, YouTube videos, and wikis). Table 1 presents the project types where most projects (24%) were completed for secondary schools, 19% of projects for non-government organisations and 14% for pre-schools. Table 2 depicts the reported knowledge and skills increase where teamwork was indicated the highest at 15%, project management at 12% and communication and interpersonal skills at 12%. Each student could report more than one knowledge and / or skill.

| <b>Project types</b>                           | <b>N</b>   | <b>Percent</b> |
|--|------------|----------------|
| Other  | 3          | 1%             |
| Government                                     | 5          | 1%             |
| Museum   | 6          | 1%             |
| Old age home                                   | 8          | 2%             |
| Learners with special educational needs school | 35         | 10%            |
| Children's home                                | 38         | 8%             |
| Animal sanctuary & Zoo                         | 39         | 9%             |
| Primary School                                 | 47         | 11%            |
| Preschool                                      | 56         | 14%            |
| NGO  | 77         | 19%            |
| Secondary school                               | 97         | 24%            |
| <b>Total</b>                                   | <b>411</b> | <b>100%</b>    |

**Table 1: Project types, number and %**

| <b>Skills acquired</b>               | <b>N</b>    | <b>Percent</b> |
|--------------------------------------|-------------|----------------|
| Other                                | 84          | 2%             |
| Internet skills                      | 100         | 3%             |
| Computer skills                      | 144         | 5%             |
| Diversity                            | 290         | 9%             |
| Building & renovation skills         | 314         | 10%            |
| Creative thinking                    | 316         | 10%            |
| Leadership                           | 319         | 10%            |
| Time management                      | 357         | 11%            |
| Communication & interpersonal skills | 382         | 12%            |
| Project Management                   | 398         | 13%            |
| Teamwork                             | 472         | 15%            |
| <b>Total</b>                         | <b>3176</b> | <b>100%</b>    |

**Table 2: Reported knowledge & skills increase, number and %**

A second output from the analysis of the reports, was to create the mapping produced in Table 3. Table 3 presents an overview of the elements of our proposed framework and for each framework element, we mapped the JCP programme in

terms of knowledge assets. We also present how the particular existing and new knowledge assets are captured in order to retain it and make it available for future projects. We could identify clear examples from the JCP module that confirm the relationships that are defined in the framework.

**Table 3. Community module mapping to the knowledge asset management framework for large-scale community projects in HEIs**

| Framework component    | Typical knowledge assets  | Knowledge asset management mechanism   |
|------------------------|---|--|
| Students               | <ul style="list-style-type: none"> <li>Existing, context specific knowledge</li> <li>Technical related knowledge pertaining to academic degree</li> </ul>   | <ul style="list-style-type: none"> <li>Project selection document</li> <li>Project motivation document</li> </ul>  |
| Faculty or lecturer    | <ul style="list-style-type: none"> <li>Institutional knowledge</li> <li>Module and learning outcomes knowledge</li> </ul>   | <ul style="list-style-type: none"> <li>Study guide</li> <li>Face-to-face briefing</li> <li>Project guideline document</li> <li>Security guideline document</li> <li>Learner management system (LMS) portal</li> </ul>  |
| Community partners     | <ul style="list-style-type: none"> <li>Community knowledge</li> <li>Service requirement specification</li> <li>Context-specific know-how</li> </ul>   | <ul style="list-style-type: none"> <li>Mentorship</li> <li>Technical guidance</li> <li>Project outcome measurement</li> </ul>  |
| Community project team | <ul style="list-style-type: none"> <li>Project requirement specification</li> <li>Project management meetings</li> <li>Community partner briefing</li> <li>Community partner quality management</li> <li>Generate new knowledge asset through experience</li> </ul> | <ul style="list-style-type: none"> <li>Brainstorming</li> <li>Project meetings</li> <li>Budget management report</li> <li>Project report</li> <li>Reflection report</li> <li>Youtube video</li> <li>Facebook page</li> <li>Wiki</li> <li>Lessons learnt report on LMS</li> <li>Community partner project evaluation</li> </ul> |

Based on this evaluation of the knowledge asset management framework for LSCPs in an HEI, we believe that the framework provides good coverage of considerations for managing knowledge assets innovatively. In addition, Table 3 presents examples of the application of the proposed knowledge asset management framework that may be referenced for module design in order to ensure that new knowledge assets are captured. Such a knowledge asset management process fosters innovation as the application of knowledge to tasks we already know how to do, results in productivity, while applying knowledge to tasks that are new and different, fosters innovation [35].

## 6. Conclusion

Scholars acknowledge the impact of innovative technologies on learning environments. Therefore, it is a requirement to outline the guiding principles and key structural elements required to manage learning environment knowledge assets contributing to all aspects of innovative learning.

In this study, we designed a knowledge asset management framework for LSCPs in higher education by considering all role players, their knowledge exchange, new knowledge assets generated and the characteristics of innovative educational models. We applied the framework by mapping it to an LSCP module from an HEI using the elements of the framework as a guide. We established that the LSCP



module that was mapped conformed well to the components identified in the knowledge asset management framework and that there was a good fit with the technologies applied for enablement.

By using the knowledge asset management framework for LSCPs in higher education, the faculty and its lecturers can ensure that the learning- and technology toolset design enables strong support to the community. Whilst students' knowledge and skills are enhanced and new knowledge assets created, stored and made available for future projects. In this way, they can ensure that the complex systems of all parties involved in LSCPs are considered through this knowledge asset approach.

## References

1. Burns, T. and F. Koster, *Governing Education in a Complex World*. Educational Research and Innovation 2016, Paris: OECD Publishing.
2. Meyer, M. and L. Wood, *A critical reflection on the multiple roles required to facilitate mutual learning during service-learning in Creative Arts education*. *Teaching in Higher Education* 2017. **22**(2): p. 158–177.
3. Bennett, D., et al., *Implementing and Sustaining Higher Education Service-Learning Initiatives: Revisiting Young et al.'s Organizational Tactics*. *Journal of Experiential Education*, 2016. **39**(2): p. 145–163.
4. Bedford, D., *A Case Study in Knowledge Management Education - Historical Challenges and Future Opportunities*. *The Electronic Journal of Knowledge Management*, 2013. **11**(1): p. 199-213.
5. Bennett, E., *A Simple, Practical Framework for Organizing Relationship-Based Reciprocity in Service-Learning Experiences: Insights from Anthropology*. *International Journal of Research on Service-Learning and Community Engagement*, 2018. **6**(1): p. 1-15.
6. Hébert, A. and P. Hauf, *Student learning through service learning: Effects on academic development, civic responsibility, interpersonal skills and practical skills*. *Active Learning in Higher Education*, 2015. **16**(1): p. 37–49.
7. Adams Becker, S., et al., *NMC Horizon Report: 2017 Higher Education Edition*. 2017, The New Media Consortium: Austin, Texas.
8. Mitchell, T.D., et al., *Reflective Practice that Persists: Connections Between Reflection in Service-Learning Programs and in Current Life*. *Michigan Journal of Community Service Learning*, 2015. **Spring**: p. 49-63.
9. Spanjaard, D., T. Hall, and N. Stegemann, *Experiential learning: Helping students to become 'career-ready'*. *Australasian Marketing Journal*, 2018. **26**: p. 163–171.
10. Halberstadt, J., et al., *Learning Sustainability Entrepreneurship by Doing: Providing a Lecturer-Oriented Service Learning Framework*. *Sustainability*, 2019. **11**: p. 1-22.
11. Mykhailyshyn, H. and K. O, *Innovation of Education and Educational Innovations in Conditions of Modern Higher Education Institution*. *Journal of Vasyl Stefanyk Precarpathian National University*, 2018. **5**(1): p. 9-16.
12. Gelmon, S.B., B.A. Holland, and A. Spring, *Assessing Service-Learning and Civic Engagement: Principles and Techniques*. Second ed. 2018, Boston, Ma: Campus Compact.
13. Bringle, R.G., P.H. Clayton, and M.F. Price, *Partnerships in Service Learning and Civic Engagement*. *Journal of Service Learning & Civic Engagement*, 2009. **1**(1): p. 1-20.

14. Bednarz, S.W., et al., *Community Engagement for Student Learning in Geography*. Journal of Geography in Higher Education, 2008. **32**(1): p. 87-100.
15. Aithal, P.S. and P. Shubhrajyotsna Aithal, *An Innovative Education Model to realize Ideal Education System*. International Journal of scientific research and management 2015. **3**(3): p. 2464-2469.
16. Harvey, M., et al., *Aligning reflection in the cooperative education*. Asia-Pacific Journal of Cooperative Education, 2010. **11**(3): p. 137-152.
17. Millican, J. and T. Bourner, *Student-community engagement and the changing role and context of higher education*. Education and Training, 2011. **53**(2/3): p. 89-99.
18. Kuklick, C.R., B.T. Gearity, and M. Thompson, *Reflective Practice in a University-Based Coach Education Program*. International Sport Coaching Journal, 2015. **2**: p. 248 -260.
19. Smuts, H. and P. Kotzé, *Client-Vendor Knowledge Transfer Mechanisms in the Context of Information Systems Outsourcing*, in *Knowledge Management in Organizations*, L. Uden, M. Heričko, and I.H. Ting, Editors. 2015, Springer, Cham.
20. Nickols, F., *The Knowledge in Knowledge Management*, in *Paper commissioned for Knowledge Management Yearbook 2000 - 2001*. 2001.
21. Clarke, T. and C. Rollo, *Corporate initiatives in knowledge management*. Education + Training, 2001. **43**(4/5): p. 206-214.
22. Nonaka, I. and H. Takeuchi, *The Knowledge Creating Company*. 1995: Oxford University Press.
23. Polanyi, M., *Tacit Knowing: Its Bearing on Some Problems of Philosophy*. Reviews of Modern Physics, October 1962. **34**(4): p. 601-606.
24. Nonaka, I., R. Toyama, and N. Konno, *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*. Long Range Planning, 2000. **33**: p. 5-34.
25. Blumenberg, S., H. Wagner, and D. Beimborn, *Knowledge transfer processes in IT outsourcing relationships and their impact on shared knowledge and outsourcing performance*. International Journal of Information Management, 2009. **29**: p. 342-352.
26. Smuts H., H.M.J., *Towards a Knowledge Conversion Model Enabling Programme Design in Higher Education for Shaping Industry-Ready Graduates*, in *ICT Education*, S. Kabanda, H. Suleman, and S. Gruner, Editors. 2019, Springer, Cham. p. 124-139.
27. Hatcher, J.A. and R.G. Bringle, *Reflection: Bridging the Gap between Service and Learning*. College Teaching, 1997. **45**(5): p. 153-158.
28. McKenney, S. and T.C. Reeves, *Conducting educational design research*. Second ed. 2019, New York: Routledge.
29. Wang, F. and M.J. Hannafin, *Design-based research and technology-enhanced learning environments*. Educational Technology Research and Development, 2005. **53**(4): p. 5-23.
30. Edelson, D.C., *Design Research: What we learn when we engage in design*. Journal of the Learning Sciences, 2002. **11**(1): p. 105-121.
31. Osman, R. and N. Petersen, *Service learning in South Africa*, ed. R. Osman and N. Petersen. 2013, Cape Town: Oxford University Press Southern Africa.
32. Castle, J. and R. Osman, *Theorising service learning in higher education in South Africa*. Perspectives in Education, 2006. **24**(3): p. 63-70.
33. Marabelli, M., et al., *Managing knowledge in large-scale virtual projects: a community-based approach*. International Journal of Managing Projects in Business, 2013. **6**(2): p. 310 - 331.
34. Jordaan, M., *Sustainability of a community-based project module*. Acta Academica, 2012. **44**(1): p. 224-246.

35. Hibbard, J., *Knowing what we know*. Information Week, 1997. **653**: p. 46-55.