

Virtual Communities of Practice for Postgraduate Research Students: Determining Needs and Reducing Isolation

Jenna Barry, Niall Corcoran

Department of Information Technology, Technological University of the Shannon (TUS), Limerick, Ireland.

jenna.barry@tus.ie

niall.corcoran@tus.ie

Abstract: Postgraduate research is considered a lonely endeavour with students frequently experiencing social and intellectual isolation. Research offices in many higher education institutions have developed programmes to support supervisors and students undertaking research studies and supervision. These programmes include instruction on research techniques and methodologies but are often lacking in community-based approaches such as creating support and peer groups where students can share information and ideas directly. This study explores the use of online communities of practice as a support tool for postgraduate researchers in a university in Ireland. The research questions seek to determine the antecedents for successful implementation, the dominant problems associated with using online communities, and the motivators for, and barriers to, participation in communities of practice in this context. The study facilitates student collaboration by implementing a community of practice on an enterprise social network (ESN) platform. These platforms are increasingly used in industry to facilitate online community groups that collaborate professionally and socially. Professionally, ESN can be used as a platform to host virtual communities of practice (vCoP), where members can engage in sharing knowledge of their practice domains and experiences. The promotion of ESN and vCoP for this study is a joint initiative of the Research Support Office, the Students' Union, and the Postgraduate Society, who advocate for a strong peer to peer support system for postgraduate students. The study adopts an Action Research design and a mixed-methods approach, and data collection includes system use metrics, surveys, focus groups and interviews. The practical objective of the project is to manage the implementation of the virtual community as a peer-to-peer support environment, and success is determined primarily from usage statistics. This may lead to developing a framework for implementation that is generalisable to other higher education institutions.

Keywords: communities of practice, student isolation, enterprise social networks, postgraduate research, knowledge sharing, action research.

1. Introduction

The postgraduate research experience is unique to every individual, generally involving considerable investment of time, money, and emotional energy (Greener, 2020). Although many postgraduate researchers work within research groups and centres, their projects are unique and require extending the existing body of knowledge in their fields with novel findings. Due to the isolating nature of research and the time commitment required, research students frequently do not have time to engage in extracurricular activities and may lack opportunities to meet and communicate with peers, increasing the chances of being isolated from other students for much of their research journey. Postgraduate loneliness and isolation are well documented and seen as an inevitable part of the research journey (Lin and Huang, 2012, McLaughlin and Sillence, 2018, Sawir et al., 2008). According to Sawir et al. (2008), the feeling of loneliness is caused by a lack of social networks and being distant from other people.

The past decade has seen a significant increase in internationalisation of higher education. Globalisation and mobility have created new possibilities for postgraduate students who may see studying abroad as prestigious and an investment in their future careers (Greener, 2020, Sawir et al., 2008). These students relocate and separate from family and friends to research in a country where the culture, customs and language may differ (Greener, 2020). Consequentially, international students may find this study period very challenging, with an increased risk of isolation from the outset, and they may never fully engage with their host institutions. Sawir et al. (2008) found that 65% of international students experienced feelings of loneliness.

Completion rates for postgraduate students are generally accepted to be considerably lower than for undergraduate students. According to Litalien and Guay (2015), attrition rates for doctoral students in North America are estimated at between 40% and 60%. Bednall (2018) places Australian public university postgraduate attrition rates at even higher levels, and Jones (2013) cites several international studies that range from 33% to 70% attrition for PhD students. For those research students that do finish, the majority take longer than the prescribed time in which to do so. For example, Van De Schoot et al. (2013) found that only 10% of PhD candidates in the Netherlands complete their studies in four years, and the average completion time is five years. Many of the 10,500 postgraduate research students currently registered with Irish universities will never complete their degrees, and many others will take far longer than is expected to complete. A 2021 survey by the Higher Education Authority (HEA) and the Union of Students in Ireland (USI), to which 34% of postgraduate students contributed, found that 36% of them were not very aware of the various supports available, such as extracurricular activities, healthcare, and counselling (HEA, 2021). The study found an even lower awareness amongst part-time research postgraduate students. 30% of respondents also indicated that they were not confident of completing their research in the allocated timeframe. It is estimated that postgraduate numbers will grow by 30% in Ireland by 2030 (Hunt, 2011). This projected growth exacerbates the challenge faced by higher education institutions (HEIs) and policy makers, and new structures and practical solutions need to be explored to meet the diverse learning and social requirements of these students.

2. Research Journey

The postgraduate research journey can be a challenging experience, with several studies reporting high-stress levels, poor mental health, and fatigue amongst students (Desa et al., 2012, Kato et al., 2019, McLaughlin and Sillence, 2018, Sawir et al., 2008). Social and intellectual isolation is common, and both contribute to feelings of loneliness (Conrad and Phillips, 1995, Crick et al., 2021, Janson, Howard and Schoenberger-Orgad, 2004, Lee and Chan, 2007, Lewis, Wolff and Bekker, 2021). Although loneliness caused by social isolation is well understood, Sawir et al. (2008, p.18) describe students feeling 'topic related loneliness', caused by having no one to discuss research topics with due to their novelty. Janson, Howard and Schoenberger-Orgad (2004) describe writing a thesis as a lonely activity. Although the time to think and write in solitude is necessary, it is likely that only a few acquaintances are sympathetic or marginally interested in the research, and finding someone to talk to can be difficult. Mewburn (2017) describes feeling isolated with accompanying imposter syndrome and cites a colleague who was surprised to complete a PhD whilst retaining any friends.

Janson, Howard and Schoenberger-Orgad (2004) describe the research journey as having peak experiences and refer to the work of Csikszentmihalyi on peak dimension. Csikszentmihalyi (1990) describes 'flow' as a level of attention so intense that it equates to complete absorption in a task. The individual is so immersed in the action that their understanding of time is skewed. Janson, Howard and Schoenberger-Orgad (2004) describe similar feelings amongst postgraduates, with a sense of anticipation, ranging from curiosity to inspiration and passion. The beginning of the postgraduate journey is filled with infinite possibilities and the students may undergo intense experiences of deep involvement and challenge. However, amongst these feelings of enthusiasm and expectation, there can also be subtle, short-lived feelings of uncertainty and anxiety. Students' emotional states fluctuate between positive and negative. There are times when they are overcome with doubt about the relevance of their chosen topic and their ability to complete the research, and they may experience imposter syndrome. The goal to finish a postgraduate research project seems unreachable and intensifies negative feelings. Janson, Howard and Schoenberger-Orgad (2004, p.4) "began to feel isolated in what seemed to be an unending emotional storm". Students can mistrust their decision to undertake the research and doubt whether they have the capability or stamina to complete their studies.

According to a HEA (2021) student survey, feelings of isolation increase for research postgraduate students who work from home or have no working space. In Ireland, only 60% of these students have adequate access to on-campus facilities required to engage with their research, suggesting an increased risk of isolation for the remainder. The suitability of the workplace and facilities is perceived in practical terms for some, such as the benefit of having a quiet room, but may also consider the opportunity to learn how to connect, collaborate, and form networks with other researchers. While autonomy is part of the research, the importance of a community and opportunities to discuss research with peers is essential.

Starting postgraduate research can be confusing due to its unstructured nature. Mewburn (2022) remembers going into the PhD office each day for months, feeling lost, wondering how a PhD was achieved, was she reading enough, and finding it difficult to organise a day. In the absence of classes, postgraduate students lack

opportunities for developing friendships and the network they provide (Sawir et al., 2008). Janson, Howard and Schoenberger-Orgad (2004) found that students felt unsupported, and with little opportunity to meet peers they lacked a sense of belonging and had no community. Ali and Kohun (2006) discuss student isolation at different phases of doctoral programmes and determine a lack of communication, miscommunication, and confusion as a basis for isolation. When students believe they have no network to join, they are more likely to experience isolation and loneliness (HEA, 2021). The HEA student survey indicates that only 47% of students feel that they have frequent opportunities to discuss their research with other research students, just 44% agree they have opportunities to become involved in the wider research community beyond their department, and just 45% agree there is someone in their institution they can talk to about their day-to-day problems.

These challenges to beginning and staying in postgraduate research have a detrimental effect on degree completion rates and it is incumbent on HEIs to address them (Greener, 2020). According to Sawir et al. (2008), loneliness is an unavoidable aspect of postgraduate research and can only be alleviated by providing structured communities for students. Being included leads to positive emotions and interaction with peers and helps students learn (Osterman, 2000). van Rooij, Fokkens-Bruinsma and Jansen (2021) found that a sense of belonging makes a substantial contribution to retention and satisfaction, and that HEIs can take action to create environments that engender a sense of belonging, emphasising the importance of social activities so that everyone can get to know each other.

3. Communities of Practice

In many HEIs, research offices have developed programmes to support supervisors and postgraduate students on the research journey. These programmes include instruction on research techniques and methodologies but are often lacking in community-based approaches, such as the creation of support and peer groups, where students can share information and ideas directly with each other. One particular type of group that may be useful is a community of practice (CoP). A CoP is a knowledge management technique that has been used in companies and public organisations for the past twenty years to provide professionals with a platform to facilitate knowledge exchanges and interpersonal interaction (Bolisani et al., 2020). According to Wenger (2011), a CoP is a group formed by people who want to engage in collective learning to advance their knowledge in a shared domain, and it facilitates the management, development, and advancement of knowledge among a group of professionals, and should assist participants in doing their work more effectively. Important CoP principles include shared goals, reciprocal accountability, open communication, mutual engagement, sharing material and emotional resources (Wisker, Robinson and Shacham, 2007). Janson, Howard and Schoenberger-Orgad (2004) describe seeking and obtaining emotional and academic support through implementing a CoP while working on their research. Eight PhD students were brought together to discuss their research journey and the reaction to their shared negative experiences led them to form a CoP, creating frequent opportunities to meet virtually and in-person to discuss theory, technical, and emotive issues. This helped the students to emerge from isolation and form a supportive peer group. Students consulted the community when they needed to, enabling problems to be solved innovatively, creating new solutions, and adapting and refining new knowledge.

According to Corcoran and Duane (2019), CoPs can be face-to-face or online, and groups can be large or small, with characteristics of informality and flexibility. Social media technologies can provide resources to manage knowledge flow to support knowledge management systems (Nisar, Prabhakar and Strakova, 2019) and are particularly useful in facilitating online or virtual CoPs (vCoP) (Corcoran and Duane, 2018). According to Murphy (2016), a vCoP is a community that supports the same fundamentals as a CoP, where members can share knowledge of their practice domains and experiences, potentially crossing geographical and political boundaries to pursue mutual interests or goals. vCoPs can be hosted on Enterprise Social Network (ESN) platforms, which are social media systems used in an enterprise environment, allowing employees to connect and communicate in a secure space. Companies have begun to incorporate ESN to foster collaboration and enable new work practices amongst employees (Leonardi, 2017). According to Dhasarathy et al. (2021), the effective use of an ESN can result in a 20% to 25% improvement in the efficiency of knowledge workers. Several studies have demonstrated that ESNs have been successfully used in industry to facilitate online community groups that collaborate professionally and socially (Brown, Sikes and Willmott, 2013, Bughin and Chui, 2013, Leonardi, 2017). Common ESN platforms include Microsoft Communities (Yammer), Facebook Workplace, IBM Connections and Salesforce Chatter (Riemer et al., 2020).

Appropriate strategies and innovations are needed to support an ever-diversified postgraduate student population and the potential of the CoP model in helping these students overcome obstacles on their journey is evident. The benefits that research students can derive from being part of a community should lay the foundations for CoP development in HEIs for this purpose. However, Makori (2015) argues that resistance to embracing digital knowledge is the standard rather than the exception and that this condition is prevalent amongst this student group. To produce tangible, meaningful change and thriving communities to support postgraduate researchers, the reasons for this resistance must be explored and understood.

4. Research Design

The underlying problem of research postgraduate student social and intellectual isolation provides a starting point for the study, and this is well evidenced in the literature (Desa et al., 2012, HEA, 2021, Kato et al., 2019, McLaughlin and Sillence, 2018, Wisker, Robinson and Shacham, 2007). It is also evident that these students lack opportunities to engage as a community within the university and this is exacerbated by a lack of essential facilities to conduct their research on campus. The Covid-19 Pandemic furthered their isolation by enforcing remote working, and this has been highlighted by the National Forum for Teaching and Learning, who emphasise the need for HEIs to examine community-based approaches to increasing the sense of connection and belonging felt by all student groups (NFTL, 2021). An online community emerged as a possible solution to increase research postgraduate student engagement with each other to reduce social and intellectual isolation.

The study explores the use of vCoP as a support tool for postgraduate researchers in a multi-campus university in Ireland. The creation and promotion of the vCoP in this context is a joint initiative of the Research Support Office, the Students' Union, and the Postgraduate Research Society, who advocate for a strong peer-to-peer support system for postgraduate students. The main objective of the project is to manage the implementation of the vCoP as a peer-to-peer support environment, and its success will be measured from usage statistics, such as total users, active users, comments, and likes. The research questions seek to determine the antecedents for successful implementation, the dominant problems associated with using online communities, and the motivators for, and barriers to, participation in CoP in this context. The practical outcome is to develop a vCoP to alleviate the pressures felt by postgraduate students, whether they be intellectual, social, or emotional. A successful implementation may lead to the development of a framework that is generalisable to other HEIs.

The practical implementation involves setting up a vCoP on an ESN for postgraduate students. Various ESN platforms were investigated to assess their suitability to host the community. Facebook, Twitter, and Instagram were considered social platforms and not formal enough to implement for communities in this context. Microsoft Teams and Microsoft Communities (Yammer) are freely available in the university and already integrated into the portals and communication channels. Microsoft Communities has similar usability to Facebook groups, and as Facebook is already a familiar tool to most people, students should find Communities user friendly and easy to navigate. The platform is secure, and community groups can be made private with restricted access, ensuring that members can feel safe communicating with their peers. The principal investigator on the project is an officeholder in the Postgraduate Research Society and is taking the lead in creating and managing the vCoP. Because Action Research (AR) is an approach that recognises the practical involvement of the researcher in implementing change and observing the results (Baum, MacDougall and Smith, 2006, Coughlan and Coughlan, 2002), it was considered to be a suitable research approach for the study.

According to Stowell and Cooray (2017), AR is used to encourage a systematic, iterative approach to research, and it is particularly suited for analysing collaborative and community groups (Kemmis, McTaggart and Nixon, 2014). The design of an AR project focuses on planning a series of interventions to promote action, creating changes that are analysed to measure their efficacy, and the results are used to inform further cycles of planning, action taking, and learning (Bruce and Easley, 2000, McNiff and Whitehead, 2010). The AR model for this study was developed by Susman and Evered (1978) and adapted by Corcoran and Duane (2018). It consists of five phases of Diagnosing, Action Planning, Action Taking, Evaluating, and Specifying Learning, as illustrated in Figure 1. For this study, the AR cycles are designed to coincide with academic semesters, allowing for up to six cycles over a two-year period, beginning in September 2022. A package of interventions will be designed for each cycle, informing the actions that need to be taken to grow the vCoP. The analysis of the impact of each intervention will inform the package of interventions for the following cycle. According to Coughlan and Coughlan (2002), although the planning, doing, and evaluation of cycles are to be expected, they cannot be entirely created or planned ahead of time.

It is anticipated that several barriers to participation will have to be addressed, including promoting awareness of the community to a large number of postgraduates distributed across several campuses; technological barriers; attitudes to using the technology; providing adequate training, and maintaining engagement. However, this list is not exhaustive, and a central research question is to discover the impact of these and other barriers that may emerge. The primary goals of the study are the successful implementation of the vCoP, to understand the dominant problems associated with using online communities, and what the motivators for, and the barriers to, participation are in this context.

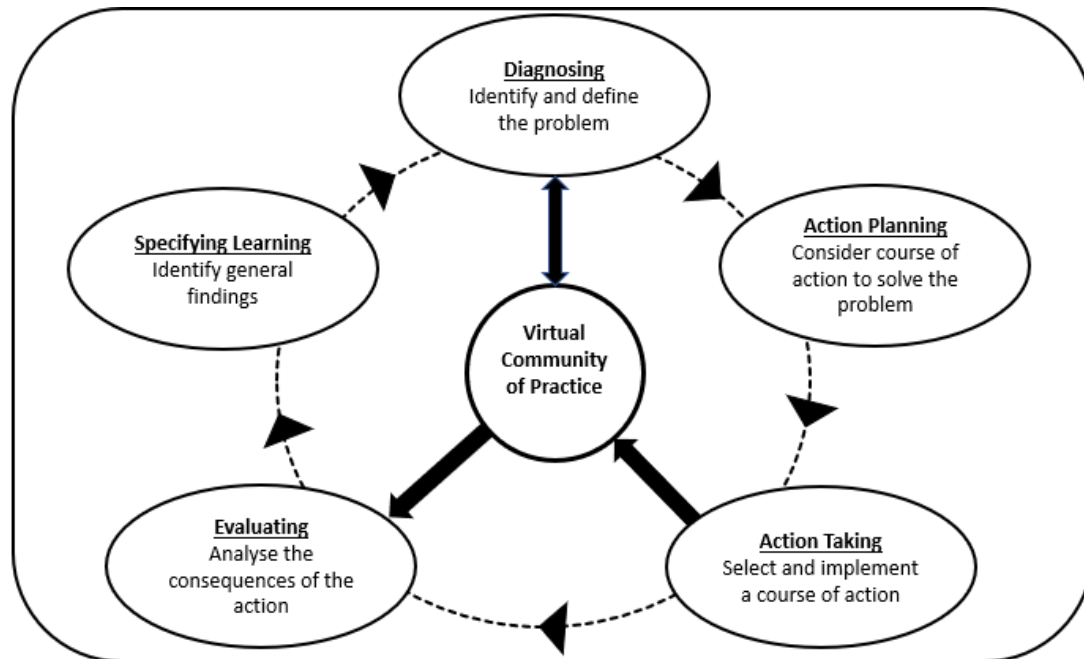


Figure 1. Phases of the AR Design

4.1 Data Collection and Analysis

The study proposes a mixed-methods approach, using several data collection techniques, including field notes, written reflections from personal logs and notes, surveys, focus groups, semi-structured interviews, and system metrics. Taking field notes from observations is an essential part of AR (McNiff and Whitehead, 2010), and these can be used to form the basis for reflective journaling, an important tool for the Evaluating and Specifying Learning phases of the AR cycles (Clark et al., 2020, Leitch and Day, 2000). System metrics from Microsoft Communities will be used to interpret use and engagement in the vCoP, and thematic analysis will be used to help understand participants' motivation for use.

During the early AR cycles, semi-structured interviews will be conducted with participants from a sample of the research postgraduates and will explore the current experience and ascertain general awareness of CoPs, ESN, and social media use. The data will be analysed to understand the current student experience, determine requirements, and how a vCoP might enhance their research experience. Focus groups will be used to facilitate a dynamic brainstorming approach with postgraduates to create a concept map of requirements (Lee-Kelley, 2019). Focus groups enable an innovative, creative thinking environment and can help to interpret experiences and understand barriers to student engagement with the vCoP (Clark et al., 2020). These group sessions will look for suggestions to improve the vCoP and discover what supports the students need to enhance their learning and social experience. Findings from the semi-structured interviews and focus groups will be used to inform questions for surveys, that will be conducted during the later AR cycles. According to Venkatesh, Brown and Bala (2013), surveys are a standard research tool for gathering information about participants' feelings, beliefs, and attitudes about a topic. A number of hypotheses will be developed from a thematic analysis of the qualitative data collected during the early AR cycles and the surveys will be designed to quantitatively examine these. Because data is informally analysed throughout an AR project to reflect on the implications for practice, and to formally analyse and develop findings, it provides an opportunity to identify unanswered questions and offers the possibility of new directions for the research (Kemmis, McTaggart and Nixon, 2014).

5. Conclusion

The postgraduate journey is ever evolving, and it is undeniable that research postgraduate students are burdened with various demands, including the pressures of research completion and meaningful knowledge generation. High dropout rates have competitive and financial impacts on HEIs as most of their research output is dependent on postgraduate students. Quality supervision, project characteristics, psychosocial factors, and research culture have been determined to influence student satisfaction and research completion. However, the prevalent research culture in HEIs does not normally address the intellectual and social isolation of students and, and it is imperative that HEIs look at new and innovative ways to support postgraduates to mitigate these problems. As CoP have been widely and successfully used by enterprises and professional groups for some time, they should be considered as a potential solution to increase peer-to-peer engagement amongst postgraduate students. CoP principals are based on shared goals, reciprocal accountability, mutual engagement, pooling of material, and emotional resources, so enabling students to connect with their peers in this manner is likely to positively affect all areas of their research. The resultant socialisation should lead to more inclusion and feelings of belonging. Research support offices need to understand the importance of social support provided by the institution to break the feeling of isolation amongst postgraduate students to help increase their chances of success. Although faculties can take initiatives to promote socialisation amongst students, the institution is better placed and equipped to provide mechanisms for promoting student interaction, and these should be a central component of postgraduate student support structures.

In developing and fostering such communities, HEIs must also afford students the time to participate in community activity. Additional workloads are common for research postgraduate students where working overtime in the evenings, weekends, and holidays is seen as the norm. Students may find it hard to refuse extra tasks fearing they may harm their future career prospects. Although supervisors play a significant role in protecting students from undertaking projects too large for one person and agreeing to too many extra responsibilities outside of their research, such as teaching, supervision, and side projects, membership of a CoP would allow students to compare their situations with their peers in other departments and disciplines and empower them to understand their own situations and perhaps resolve them.

There is limited research on the use of community-based approaches to support research postgraduate students and it is increasingly important to understand how they may be used as support tools in this context, particularly with likely further pandemic-enforced remote working arrangements. A lack of on-campus facilities available for research postgraduates is also likely to enforce remote working in this group as numbers grow, and this may increase the sense of isolation for students affected. In seeking to understand the social and collaborative needs of research postgraduate students, determining the barriers to participation in a vCoP, and discovering the perceived benefits of participation, this study should be of interest to others working in this field, research support offices, and policy makers in HEIs.

References

- Ali, A. and Kohun, F. (2006) "Dealing with isolation feelings in IS doctoral programs", *International Journal of Doctoral Studies*, Vol. 1, No. 1, pp 21-33.
- Baum, F., MacDougall, C. and Smith, D. (2006) "Participatory Action Research", *Journal of Epidemiology and Community Health*, Vol. 60, No. 10, pp 854-857.
- Bednall, T. C. (2018) "PhD Completion: an Evidence-Based Guide for Students, Supervisors and Universities", The Conversation Media Group, Melbourne.
- Bolisani, E., Fedeli, M., Bierema, L. and De Marchi, V. (2020) "United We Adapt: Communities of Practice to Face the CoronaVirus Crisis in Higher Education", *Knowledge Management Research and Practice*, Vol. 19, No. 4, pp 454-458.
- Brown, B., Sikes, J. and Willmott, P. (2013) "Bullish on Digital: McKinsey Global Survey Results", McKinsey & Company, New York and London.
- Bruce, B. C. and Easley, J. A. (2000) "Emerging Communities of Practice: Collaboration and Communication in Action Research", *Educational Action Research*, Vol. 8, No. 2, pp 243-259.
- Bughin, J. and Chui, M. (2013) "Evolution of the Networked Enterprise: McKinsey Global Survey Results", McKinsey & Company, San Francisco and Brussels.
- Clark, J. S., Porath, S., Thiele, J. and Jobe, M. (2020) *Action Research*, New Prairie Press, Kansas.
- Conrad, L. and Phillips, E. M. (1995) "From Isolation to Collaboration: A Positive Change for Postgraduate Women?", *Higher Education*, Vol. 30, No. 3, pp 313-322.
- Corcoran, N. and Duane, A. (2018) "Using Social Media to Enable Staff Knowledge Sharing in Higher Education Institutions", *Australasian Journal of Information Systems*, Vol. 22, No. 1, pp 1-26.
- Corcoran, N. and Duane, A. (2019) "Using Social Networks and Communities of Practice to Promote Staff Collaboration in Higher Education", In: Fedeli, M. & Bierema, L. L. (eds.) *Connecting Adult Learning and Knowledge Management*. Switzerland: Springer.
- Coughlan, P. and Coughlan, D. (2002) "Action Research for Operations Management", *International Journal of Operations & Production Management*, Vol. 22, No. 2, pp 220-240.
- Crick, T., Davenport, J. H., Hayes, A., Irons, A. and Prickett, T. (2021) "Supporting Early-Career Academics in the UK Computer Science Community", Paper read at CEP '21: Computing Education Practice 2021, Durham, United Kingdom, 7th January.
- Csikszentmihalyi, M. (1990) "Flow: The Psychology of Optimal Experience", *Academy of Management Review*, Vol. 16, No. 3, pp 636-640.
- Desa, A., Yusoooff, F., Ba'yah, N. and Kadir, A. (2012) "Acculturative Stress Among International Postgraduate Students at UKM", *Procedia - Social and Behavioral Sciences*, Vol. 59, No. 1, pp 364-369.
- Dhasarathy, A., Frazier, R., Khan, N. and Steagall, K. (2021) "Seven Key Lessons on Technology and Business", McKinsey Digital, Chicago.
- Greener, S. (2020) "Peer Support Among Doctoral Students: #Docconnect", Paper read at 7th European Conference on Social Media (ECSM), Larnaca, Cyprus, July.
- HEA (2021) "The Irish Survey of Student Engagement for Postgraduate Research Students National Report 2021", Higher Education Authority, Dublin, Ireland.
- Hunt, C. (2011) "National Strategy for Higher Education to 2030", Department of Education and Skills, Dublin, Ireland.
- Janson, A., Howard, L. and Schoenberger-Orgad, M. (2004) "The Odyssey of Ph.D. Students Becoming a Community of Practice", *Business Communication Quarterly*, Vol. 67, No. 2, pp 168-181.
- Jones, M. (2013) "Issues in Doctoral Studies - Forty Years of Journal Discussion: Where have we been and where are we going?", *International Journal of Doctoral Studies*, Vol. 8, No. 1, pp 83-104.
- Kato, H., Burger, A. P., Emoto, K., Sakama, R., Uehara, Y., Segon, A. and Lin, J. J. (2019) "Prevalence of Fatigue among Postgraduate Trainees in the United States and Japan", *Journal of General and Family Medicine*, Vol. 20, No. 6, pp 260-263.
- Kemmis, S., McTaggart, R. and Nixon, R. (2014) *The Action Research Planner: Doing Critical Participatory Action Research*, Springer, Singapore.
- Lee-Kelley, L. (2019) *Collaborative Action Research: A Dynamic Intervention Project to Create a Purposeful Virtual Community-of-Practice*, Sage, London.
- Lee, M. J. W. and Chan, A. (2007) "Reducing the Effects of Isolation and Promoting Inclusivity for Distance Learners Through Podcasting", *Turkish Online Journal of Distance Education*, Vol. 8, No. 1, pp 85-104.
- Leitch, R. and Day, C. (2000) "Action research and reflective practice: towards a holistic view", *Educational Action Research*, Vol. 8, No. 1, pp 179-193.

Leonardi, P. M. (2017) "The Social Media Revolution: Sharing and Learning in the Age of Leaky Knowledge", *Information and Organization*, Vol. 27, No. 1, pp 47-59.

Lewis, C., Wolff, K. and Bekker, B. (2021) "Supporting Project-Based Education Through a Community of Practice: A Case of Postgraduate Renewable Energy Students", *World Transactions on Engineering and Technology Education*, Vol. 19, No. 1, pp 35-40.

Lin, S. H. and Huang, Y. C. (2012) "Investigating the Relationships Between Loneliness and Learning Burnout", *Active Learning in Higher Education*, Vol. 13, No. 3, pp 231-243.

Litalien, D. and Guay, F. (2015) "Dropout Intentions in PhD Studies: A Comprehensive Model Based on Interpersonal Relationships and Motivational Resources", *Contemporary Educational Psychology*, Vol. 41, No. 1, pp 218-231.

Makori, E. O. (2015) "Micro Factors Influencing Use of Electronic Information Resources Among Postgraduate Students in Institutions of Higher Learning in Kenya", *Library Hi Tech News*, Vol. 32, No. 1, pp 18-21.

McLaughlin, C. J. and Sillence, E. (2018) "Buffering Against Academic Loneliness: The Benefits of Social Media-Based Peer Support During Postgraduate Study", *Active Learning in Higher Education*, Vol. 2018, No. 1, pp 1-14.

McNiff, J. and Whitehead, J. (2010) *You And Your Action*, Routledge, New York.

Mewburn, I. (2017) "The Principled PhD?", *The Thesis Whisperer* [Online], <https://thesiswhisperer.com/2017/08/09/the-principled-phd/>.

Mewburn, I. (2022) "The PhD Supply Chain Problem", *The Thesis Whisperer* [Online], <https://thesiswhisperer.com/2022/02/02/the-phd-supply-chain-problem/>.

Murphy, G. (2016) "An MBA Cohort's Use of an Enterprise Social Network for Collaborative Learning", *e-Journal of Business Education and Scholarship of Teaching*, Vol. 10, No. 1, pp 1-19.

NFTL (2021) "Next Steps for Teaching and Learning: Moving Forward Together", National Forum for Teaching and Learning, Dublin, Ireland.

Nisar, T. M., Prabhakar, G. and Strakova, L. (2019) "Social Media Information Benefits, Knowledge Management and Smart Organizations", *Journal of Business Research*, Vol. 94, No. 1, pp 264-272.

Osterman, K. F. (2000) "Students' Need for Belonging in the School Community", *Review of Educational Research*, Vol. 70, No. 3, pp 323-367.

Riemer, K., Lee, L. L., Kjaer, C. and Haeffner, A. (2020) "Identification of Enterprise Social Network (ESN) Group Archetypes in ESN Analytics", *Australasian Journal of Information Systems*, Vol. 24, No. 1, pp 1-20.

Sawir, E., Marginson, S., Deumert, A., Nyland, C. and Ramia, G. (2008) "Loneliness and International Students: An Australian Study", *Journal of Studies in International Education*, Vol. 12, No. 2, pp 148-180.

Stowell, F. and Cooray, S. (2017) "Virtual Action Research for Virtual Organisations?", *Systemic Practice and Action Research*, Vol. 30, No. 2, pp 117-143.

Susman, G. I. and Evered, R. D. (1978) "An Assessment of the Scientific Merits of Action Research", *Administrative Science Quarterly*, Vol. 23, No. 4, pp 582-603.

Van De Schoot, R., Yerkes, M. A., Mouw, J. M. and Sonneveld, H. (2013) "What Took Them So Long? Explaining PhD Delays among Doctoral Candidates", *PLoS ONE*, Vol. 8, No. 7, pp 1-11.

van Rooij, E., Fokkens-Bruinsma, M. and Jansen, E. (2021) "Factors That Influence PhD Candidates' Success: The Importance of PhD Project Characteristics", *Studies in Continuing Education*, Vol. 43, No. 1, pp 48-67.

Venkatesh, V., Brown, S. A. and Bala, H. (2013) "Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems", *MIS Quarterly*, Vol. 37, No. 1, pp 21-54.

Wenger, E. (2011) "Communities of Practice: A Brief Introduction", University of Oregon, Oregon.

Wisker, G., Robinson, G. and Shacham, M. (2007) "Postgraduate Research Success: Communities of Practice Involving Cohorts, Guardian Supervisors and Online Communities", *Innovations in Education and Teaching International*, Vol. 44, No. 3, pp 301-320.