5-15-2023

SHEDDING LIGHT ON RESILIENCE IN NURSING: THE INFLUENCE OF DIGITAL TECHNOLOGY USE IN CLINICAL CARE ON NURSES' SENSE OF COHERENCE

Marius Mueller

Michael Knop

Christian Rester

SHEDDING LIGHT ON RESILIENCE IN NURSING: THE INFLUENCE OF DIGITAL TECHNOLOGY USE IN CLINICAL CARE ON NURSES' SENSE OF COHERENCE

Research in Progress

Marius Mueller, VDI/VDE Innovation + Technik GmbH, Germany, marius.mueller@vdivde-it.de

Michael Knop, Deggendorf Institute of Technology, Germany, michael.knop@th-deg.de

Christian Rester, Deggendorf Institute of Technology, Germany, christian.rester@th-deg.de

Abstract

The nursing discipline is increasingly confronted with far-reaching challenges that are a prominent subject in public discourse. Factors such as growing numbers of chronically ill patients and an ongoing decrease in medical personnel impose unprecedented strain on clinical care providers and nurses, which requires high levels of resilience on an individual and organizational level. The introduction of digital information and communication technology (ICT) in the workplace is intended to counteract these challenges and foster resilient everyday care. However, studies that investigate the interplay of digitalization and individual resilience are scarce. Hence, we propose a mixed-method approach to explore how ICT use in a clinical work setting influences nurses' sense of coherence. This construct has been used as a theoretical foundation to investigate resilience in nursing. Further, the exploration of individual coping strategies in the light of ICT-related disturbances in the workplace and associated job-related outcomes complement the research agenda.

Keywords: Nursing, Digital technologies, Sense of coherence, Resilience.

1 Introduction

Throughout the years, both the public and health sciences have identified, observed and broadly discussed an increasing demand in nursing. Several drivers of this incline have been pinned down, such as growing patient numbers and nursing cases, which oftentimes root in higher prevalence of diseases and health issues coming along with demographic, environmental and societal changes (Demiris & Hensel, 2008; Marć et al., 2018). In addition, a lack of professionals and medical personnel can be overserved, both spatially and regarding numbers. This development is especially noticeable in rural and remote areas, where the exodus of health providers forms a major societal challenge (Mueller et al., 2020). The COVID-19 pandemic has aggravated this detrimental state and has led to record numbers in professionals quitting (Oster et al., 2022). Reasons for that, for example in case of the lacking attractiveness of rural settlements (Hines et al., 2020) as well as low payment rates in the light of increasing per capita workload (Chang et al., 2019), remain to be subjects of public discourse.

Looking at the domain of nursing, a widespread detrimental state of working conditions becomes apparent, which oftentimes obliges nursing staff to quit due to negative psychological and physiological effects of working under such high pressure (Wu et al., 2012). Most recently, the COVID-19 pandemic has induced novel stressors within the nursing domain, ranging from even higher patient numbers in short periods of time to policies and restrictions that directly affect core practices such as personal

contact to patients (Lou et al., 2022). The aforementioned circumstances confront nurses with demanding challenges in the workplace, which call for high degrees of individual, social and organizational resilience.

The application of digital information and communication technology (ICT) stands out as a promising way to (partially) counteract these challenges by empowering nurses to work more efficiently, which can to some extent compensate the lack of medical personnel, reduce individual strain in the workplace and allow for more time in direct patient care. For example, studies have shown that the implementation of electronic barcode medication administration (BCMA) systems leads to significant time savings (Moore et al., 2020) and a reduction of treatment errors (Bonkowski et al., 2013; Poon et al., 2010) in everday care. As a result, digital technologies in nursing have become an essential factor (Rubeis, 2021). Examples for ICT applications in nursing range from documentation and management systems, over monitoring devices to robotics that support care practices such as medication (Booth et al., 2021).

ICT that is intended to support nurses' activities and everyday care can also collide with individual and oftentimes experience-based working patterns and approaches to care. As a result, mechanisms of nurses to handle stressful events and conflicts in the workplace might not be applicable in situations that (newly) demand ICT use. Therefore, the individual resilience is at stake. Literature describes resilience as a multidimensional construct which is influenced by individual, social and cultural aspects (Pooley & Cohen, 2010). While the definition is still subject to debate, resilience can be defined as an "adaptive stress resistant personal quality" (Ahern et al., 2008, p. 32) as well as "a class of phenomena characterised by good outcomes in spite of serious threats to adaptation or development" (Masten, 2001, p. 228). Thus, resilience can be framed as a personal trait when it comes to avert negative consequences of stressful, adverse or even threatening situations. In the workplace, resilience can further be described as a twofold process, encompassing the experience of adversity (e.g., work stress) as well as the behavioral ability to positively adapt and re-establish a state of well-being and performance (Hartmann et al., 2020). According to literature, both coping behavior as well as personal and environmental factors constitute resilience mechanisms (Fisher et al., 2019).

When looking at resilience as a process that encompasses perceptional and behavioral mechanisms, the *sense of coherence* (SOC) concept holds great explanatory meaning within the nursing discipline. According to salutogenic theory, SOC can be defined as "one of the most critical determinants of the capacity to cope successfully with distress" (p. 1) and relies on the mobilization of biological, material and psychosocial factors (Masanotti et al., 2020). The concept has been widely used as a theoretical concept in research to investigate an individual's capabilities and strategies to cope with stressful situations, both from a patient (Sundberg et al., 2022) and a nurse perspective (Masanotti et al., 2020). Studies broadly utilized SOC as a construct to explain health-related as well as job-related outcomes such as mental health and stress, job satisfaction, turnover intentions, and work-life-balance (Masanotti et al., 2020; Matsuo et al., 2021).

The SOC concept consists of three integral components that describe an individual's capabilities to cope with stressful situations and problems, i.e., *comprehensibility* (perceive the environment as being structured), *manageability* (belief in the availability of needed resources) and *meaningfulness* (perceive events as meaningful and worthwhile) (Masanotti et al., 2020). Thus, these SOC components resemble integral factors of resilience. When translated to the work context and the nursing domain in particular, SOC can be seen as a valuable resource for nurses since it conceptualizes the degree of individual resilience and the capability to cope with stressful and troublesome situations and issues, which, as stated before, occurs increasingly often. Here, it has been utilized by nursing researchers as a theoretical underpinning.

Research lacks studies that shed further light on the role of SOC in a digitalized work environment and how issues evoked by technology use influence the maintenance, reduction or re-establishment of individual SOC. These novel insights can further shed light on how this "digitally influenced SOC" affects work-related outcomes such as job self-efficacy, perceived effectiveness and job satisfaction, complementing previous studies. It can be assumed, drawing from literature, that the introduction and continuous use of digital technologies in the healthcare workplace has significant effects on an

individual, social and organizational level, rendering new individual and more flexible work patters (Imison et al., 2016) and business processes (Laurenza et al., 2018), division of labor across teams (Knop et al., 2021), as well as novel expectations towards managers and executives regarding the guidance and communication given to employees in a digital work environment (De Leeuw et al., 2020).

This research-in-progress paper proposes an explorative mixed-methods study investigating how nurses' individual SOC is influenced by ICT use in a clinical work environment. Our objective is to deliver novel insights on the formation of resilience in nursing with specific regard to modern digitalized work paradigms. This study is expected to contribute to nursing sciences as well as the greater area of ICT use behaviour by unveiling the interrelation of ICT-related disturbances in clinical care and nurses' coping behavior and strategies. The latter in particular enrich our understanding of the success and failure of ICT in clinical nursing with regard to theoretical constructs on an individual level, i.e., resilience and SOC. Since SOC is a general concept describing an individual's ability to handle stressful situations, in the remainder of this paper, we use SOC in terms of work-related SOC to avoid blending this concept with an individual's private and life-spanning sense of coherence.

To achieve our objective, we propose four research questions. First, in order to understand the effects of ICT-related adverse events in the workplace, we seek to unveil what stressful situations emerge from ICT use in everyday clinical care and how they impact nurses' individual SOC. Second, investigating the perceptions of nurses after encountering adverse ICT-related events allows us to further elaborate on the effects of a disrupted SOC on relevant outcomes that foster continuous and high quality care. Third, coping mechanisms that are applied to deflect adverse situations and potential threats for the individual or the work performance need to be examined. Fourth, by unveiling relevant relationships and constructs, we are able to develop a holistic model. Our research is thus guided by the following research questions (RQs):

RQ 1: How do stressful situations in clinical nursing, which are evoked by technology use and occurring problems and work-effecting incidents, emerge and how do they influence SOC and its three components comprehensibility, manageability and meaningfulness?

RQ 2: What work-related outcomes (e.g., job satisfaction, self-efficacy) are influenced by deteriorations caused by negative technology-related incidents and how do they relate to SOC?

RQ 3: How do nurses cope with these situations and what strategies are applied during clinical everyday care processes to maintain or reestablish SOC?

RQ 4: How can the relationships between workflow disturbances, SOC and work-related outcomes be generalized and modelled?

2 Theoretical Background

2.1 The Impact of Digitalization on the Nursing Profession

As stated before, the introduction of digital technologies in nursing yields the potential to counteract prevalent challenges and shortcomings in today's nursing practice. Research has shown that the application of digital technologies yields benefits in a clinical environment such as emergency rooms and intensive care units (Marques da Rosa et al., 2021). Going even further, a call for redefining nursing into a digitally enabled profession that inherently counts on the use of digital technologies in order to face regional and global challenges can be identified (Booth et al., 2021). The care and healing process becomes more and more a matter of technology besides medical and psychological aspects (Hack-Polay et al., 2022).

Examples for the use of ICT in the nursing domain cover a wide range of applications and technical advancements. Technologies, amongst many other, range from documentation and recommendation systems, robotics (Krick et al., 2019), over artificial intelligence applications and monitoring systems to functionalities supporting the triage of chronically ill patients (Booth et al., 2021). Looking at the variety of clinical nursing tasks, the applicability of ICT can differ across units. In intensive care units, for instance, highly sensitive monitoring devices and algorithms are used to gather, integrate, analyze and

present live patient data (De Georgia et al., 2015; Poncette et al., 2020). Here, the interaction between nurse and ICT oftentimes occurs in stressful situations and requires timely interventions, for instance in case of an alarming state of the patient. As another example, looking at surgical units, technologies in the form of electronic health records and medication management tools are utilized to coordinate, plan and execute treatments and operations (Zadvinskis et al., 2018). Here, while interactions with an ICT system might not be as stressful and urgent, errors or problems emerging from technology use might yield great negative effects on the patient's health and safety.

Digital technologies that are introduced in the workplace can interfere with individuals' ways of dealing with job-related events and needs. These routines oftentimes have been elaborated and emerged over longer time periods (such as handling specific symptoms or cater to an individual patient's needs), rooting in training that seeks to establish resilience in a stressful and dynamic nursing workplace (Walsh et al., 2020). Experience-guided work and underlying tacit knowledge that has been accumulated over time appear to be essential for the quality of care (Herbig et al., 2001) as well as work engagement (Hendriks et al., 2016). Hence, workflows that have been learned and have shown to be applicable and efficient with regard to a person's resources, expectations and goals can be questioned in the light of digitally driven nursing. This conflict might even lead to a perceived deindividualization of nursing practices (Timmons, 2003). Research has shown that the direct and personal interaction with patients represents one of the most satisfying aspects of nursing (Koivunen et al., 2013). Hence, technologies that can deteriorate or substitute this personal interaction are prone to be criticized and ultimately waived. This can be observed, in some cases, with regard to a low fit between ICT use and nursing practice (Lin, 2014; Timmons, 2003).

Research has indicated a plethora of examples showcasing technology-related problems and stressful situations in clinical nursing. For instance, the slow operation of systems and lacking data retrieval and input functionalities have been criticized in the clinical nursing context. On another note, several hampering factors have been identified when it comes to nurses' beneficial and continuous ICT use in the workplace (Brown et al., 2020; Krick et al., 2019). For instance, privacy issues emerge in case of accidentally disclosing confidential patient information through observable displays in the clinic. Another example lies in the increased temporal and cognitive effort for routine tasks like documentation that come with the implementation of ICT such as electronic health records (EHR) or computerized provider order entry (CPOE) systems (Moore et al., 2020). In many cases, the introduction of EHRs has led to a double documentation of patient data since every profession involved (including nurses) edits the EHR separately (Törnqvist et al., 2016). Here, a low fit between the technology and nursing tasks can be observed (Moore et al., 2020).

The applicability, performance, perception and use of digital technologies become a major part when creating resilient care settings and nursing structures. The deterioration of resilience amongst individual nurses and care units holds the potential to negatively impact the quality of care, since it interferes with the capabilities to handle stressful situations and work-related challenges in the light of systemic standards (Lanz & Bruk-Lee, 2017), impairing individual job-performance (Jo & Sung, 2018). This is of particular importance since nursing is a medical profession rooted in social interaction and interindividual solicitude, which does not intuitively call for digital innovations.

In an increasingly digitalized work environment, nurses are facing challenges when it comes to adapt to the usage of novel digital tools and the resulting work procedures and alternated practices. In other words, digital tools, that are intended to guide nurses in dealing with more and more stressful and demanding activities, change the way things are done. Hence, a shift towards fully or partially digitalized work patterns holds the risk of causing conflicts between elaborated and individualized workflows and new expectations that come with the introduction of digital technologies into nursing (Timmons, 2003), ultimately altering the role and self-image of nurses (Rubeis, 2021). Changes to the internal (e.g., an individual's preferred workflow) and external environment (e.g., the obligation to use digital technologies within work routines) as well as the need for new resources (such as skills in using computers and other digital tools) can cause a renunciation of established practice and thus an incoherent state. Here, the *sense of coherence* concept comes in place and delivers meaningful insights into how individuals deal with stressful situations and changes.

2.2 The Sense of Coherence Concept

The *sense of coherence* concept, in its core, includes three subdimensions (Antonovsky, 1987; Kleiveland et al., 2015). *Comprehensibility* is defined as an individual's perception of the internal or external environment being structured, predictable and consistent; *Manageability* is defined as the belief in the availability of resources that help an individual to deal with problems; *Meaningfulness* is defined as an individual's perception that life events are meaningful and worth the investment of effort and energy.

Transferring the SOC concept to the context of work, an individual's SOC level "*consequently influences how […] job demands (hours and pattern of work, workload, […] aspects of a job that require continuous physical and/or psychological effort) are perceived, appraised, faced and overcome*" (Masanotti *et al.*, 2020, p. 1-2). As stated before, the introduction and continuous use of ICT in clinical healthcare imposes new job demands on nurses, since it comes with new or altered working patterns and requires individual literacy and cognitive attention when it comes to troubleshooting and using it effectively. Hence, SOC appears to be a promising concept in the digitalized work domain of nurses.

The SOC concept has been applied in many studies throughout the last two decades, targeting both patients (Sundberg et al., 2022) as well as nurses (Masanotti et al., 2020). From a care provider perspective, SOC has been widely used to investigate constituting factors of nurses' individual resilience. A recent literature review on the application of SOC in nursing identified 39 studies covering work-related and individual variables as well as interventions (Masanotti et al., 2020). For example, studies cover constructs such as work life balance and quality of life (QoL) with SOC being a significant predictor of QoL (Kowitlawkul et al., 2019) as well as mental health status and job satisfaction both showing a positive correlation with SOC (Ida et al., 2009; Kikuchi et al., 2014; Miyata et al., 2015). Another study has shown a negative correlation between SOC and variables from the Nursing Stress Inventory such as lack of organizational support and job demands (van der Colff & Rothmann, 2009), while a positive correlation between SOC and coping strategies was found. This indicates that higher levels of SOC have a positive effect on nurses' perceived stress in the workplace and their ability to deal with stressors.

Most of the studies accumulated in the mentioned review are of a quantitative nature and follow a cross-sectional or pre-post questionnaire design (31 out of 39, 79%). Only two studies apply a triangulated mixed-method design investigating the interplay of traumatic events and individual SOC at work (Michael & Jenkins, 2001) and the linkage between SOC and professionally thriving nurses (Stock, 2017). Hence, a propensity for quantitative mono-method approaches becomes apparent.

Previous literature falls short in focusing on the use of ICT in nursing and its effect on SOC and job-related outcomes. As stated before, digitalized care practices impose new challenges on nurses, in addition to already existing stressors such as frequent nurse-patient interaction in the light of personnel shortages. Thus, a new and advanced perspective is needed that sheds further light on the relevance of individual levels and components of SOC in a digitalized work environment and the accompanying constitution of resilient nursing practices. To that end, in order to gather rich empirical insights on the interplay of ICT and SOC in nursing, explorative mixed-method approaches that examine nursing practices over time appear to be a valuable and insightful research approach. This, in turn, enables the detailed illumination of nurses' behavior and applied coping strategies regarding ICT use.

3 Methodological Approach

To answer our research questions, we follow an exploratory-sequential mixed-methods approach considering subjective knowledge and understanding of nurses, as well as objective interrelations between relevant factors and outcomes (Venkatesh et al., 2013).

We plan to utilize participant observations of nurses' shifts (7.5 hours) to recreate the daily routines and the emergence of workflow disturbances of participants in order to detect stressful work situations, especially technology-induced disruptions, and analyze their effect on nurses' SOC (RQ 1). By combining these observations with qualitative interviews at the end of nurses' shifts (to ensure that

possible incidents are still recallable, but workflows are not disrupted by interviewing), we expand our investigation on nurses' strategies to counteract workflow disturbances and explore the consequences for nurses' SOC and work-related outcomes (e.g., job satisfaction, self-efficacy) (RQ 2, RQ 3). Here, we use a Grounded Theory (Matavire & Brown, 2013) approach to inductively generate content-related categories and their relationships. Then, these categories and their relationships are used to create a standardized model to generalize relationships between workflow disturbances, SOC and relevant work-related outcomes (RQ 4). We use standardizing methods such as structural equation modeling (Kline, 2015) including already existent and validated latent constructs related to our results from the qualitative part of our study as variables, e.g., nurses' professional self-efficacy (Caruso et al., 2016), job satisfaction, or organizational support (Liu et al., 2018). In addition, we plan to analyze underlying dimensions of technology-induced workflow disturbances and sort different types of them by using multidimensional scaling (Goode & Gregor, 2009; Knop et al., 2021). As a result, we are able to differentiate technology-induced workflow disturbances and their effect on nurses' SOC.

For reasons of sampling, we plan to reach out to at least three different hospitals participating in an interregional network for nursing education and research. Following an inductive approach at first, we plan three observations (and interviews respectively) each with six different nurses or more, until data saturation is attained. In order to derive content-related categories following our Grounded Theory approach, we utilize MAXQDA for qualitative data analysis. For a deductive testing of our theoretically and inductively derived model about ICT-related and work-related factors influencing nurses' SOC, we generate a sample of at least 20 participants per latent construct (Kline, 2015), which translates to approximately 120-160 participants, depending on the number of latent constructs of our deduced model. In this manner, we roll out a multicentric survey study and are able to compare different units, teams and nurses regarding our research questions. Additional multidimensional scaling (a standardizing method to visualize similarities and dissimilarities between participants regarding a specific variable) is used to differentiate subdimensions (types) of technology-induced workflow disturbances and nurses' reaction to them with an initial sample of 20 participants. For statistical analysis, we utilize the software environment R (R Core Team, 2022).

4 Preliminary Discussion

Looking at the three core components of SOC, the study can deliver novel insights on how ICT fosters resilient nursing. Looking at *comprehensibility*, which covers the perception of the environment being structured, predictable and consistent, a theoretical link to an individual's literacy with regard to both nursing itself as well as ICT can be drawn. Nurses with a sound understanding of an ICT's functionality and behaviour are able to predict, assess and potentially resolve problematic ICT-related situations on their own. They develop mechanisms to cope with adverse events (relating to RQ1 and RQ3). Thus, they can form a positive attitude towards computers in the workplace (Gürdaş Topkaya & Kaya, 2015). That way, an ICT-infused work environment becomes much more consistent with nurses' expectations, which in turn is positively related to work-related outcomes (relating to RQ2) such as job satisfaction (Khezri & Abdekhoda, 2019). As a result, in order to achieve needed levels of computer-related competence, targeted training programs are needed and require healthcare organizations to make room for proper education in ICT use in the light of already packed and stressful shifts.

The second component of SOC, *manageability*, deals with resources at an individual's disposal to manage stressful situations. Here, both job-related and social resources appear to be of theoretical meaning. Job-related resources, for instance, occur in the form of alternative working patterns and approaches enabling nurses to operate properly in case an ICT hinders a timely execution of nursing tasks. Workarounds represent an often followed path to overcome poorly functioning ICT, for example in case of barcode-based medication management that suffers from unreadable barcodes and oblige nurses to do it manually (Dykes & Chu, 2021). Thus, workarounds represent a form of coping strategy applied by nurses to establish a positive personal and performance-based state, which relates to our RQ3. Looking at social resources in the workplace, organizational support is deemed to be a helpful factor when it comes to troubleshooting and avoiding users' resistance towards ICT (Huang, 2015).

Organizational support covers efforts to ease the change to digitalized work (Kim & Kankanhalli, 2009) and thus forms an important factor in achieving resilient nursing.

On another note, *meaningfulness* as the third component of SOC can deliver further insights on the nursing profession itself, since it is able to describe what is of essential meaning and value in the workplace. Nurses attaching a high meaning to resolving an ICT-related problem or stressful situation without applying avoidance strategies (such as workarounds that circumvent the use of ICT) might imply that the digitalized work patterns resemble an integral part of the nursing profession per se. As literature shows and in relation to our RQ2, nurses' identification with the profession represents an important outcome and strongly influences the maintenance of job satisfaction (Niskala et al., 2020). This, however, might also depend on the respective leadership the nurses experience. When it comes to ICT diffusion, superiors and the way they communicate, legitimate and enforce the use of ICT in healthcare can have major effects on nurses' behavior. For instance, research indicates that a superior's high levels of ICT literacy as well as a transparent communication of expectations, boundaries and goals that accompany ICT use can have a positive effect on the employees trust and perceptions regarding digitalized work patterns (Hadi-Moghaddam et al., 2021; Ricciardi et al., 2019).

In addition, as current studies have shown (Knop et al., 2021), medical professionals are classifying different types of technology concerning their relevance for daily routines and judge their usefulness by situational and individual aspects of technology use. There, our study contributes to the rising necessity to differentiate the situational benefit of ICT in clinical environments and creates meaningful insights for theoretical reasoning about a successful and lasting human-technology collaboration.

5 Conclusion & Outlook

The study proposed in this paper utilizes an explorative mixed-methods approach to shed light on the roles of ICT use and SOC in creating and maintaining resilient work environments in clinical nursing. By answering the guiding research questions, we expect to gather rich insights on the effects of work disturbances and adverse events caused by ICT use on nurses' individual SOC and resilience (RQ1). Further, we seek to elaborate on applied coping strategies to deal with ICT-related stressors during clinical shifts (RQ3) as well as the influence of ICT-shaped SOC on job-related outcomes (RQ2). Finally, we are interested in major drivers for resilient digitalized nursing. As a result, this research has the potential to yield valuable findings that are of interest for multiple disciplines, most dominantly Information Systems (IS) and digital healthcare research as well as nursing.

Further, this study serves as a basis for future research on the overall impact of ICT use on the work experience of nurses. Considering that a meaningful and longer work experience negatively correlates with the intention to quit a job (Masum et al., 2016), it is of high interest to investigate the internal structure of nurses' resilience in relation to different work-related stressors and the complementary role of ICT use. For instance, one interesting research question emerges with regard to ICT as a stressor, oftentimes handled under the term *technostress*. Nurses, as research indicates, need to have high levels of resilience in order to function in the highly dynamic and increasingly stressful healthcare domain. To that end, investigating whether ICT-related stressors have a measurable negative impact on a nurse's overall resilience, performance and well-being represents a promising direction for consecutive studies. In addition, it can be assumed that SOC as well as individual coping mechanisms potentially exhibit a strong theoretical tie to technology acceptance research. While SOC, as described above, triggers in specific situations in order to cope with a stressful situation, this might have implications for nurses' ICT use behavior in the long run. Repeated workflow deteriorations caused by ICT hold the potential to negatively impact nurses' willingness to use a technology. Here, further studies on the relation between SOC and use behavior as well as its determinants (such as performance and effort expectancy drawn from the UTAUT model (Venkatesh et al., 2003)) represent a promising avenue for subsequent research.

As the proposed study seeks to explore and unveil, the introduction and application of digital technologies within nursing practices is expected to have significant effects on how SOC is formed, maintained and valued. Hence, the applicability of previous studies and the models they propose mostly through a cross-sectional design is limited in a digitalized work environment and the encompassed ICT-

related stressors. Thus, looking further ahead, the goal is to establish and test a holistic model of SOC in digitalized nursing. Here, this study provides rich insights on relevant constructs and theoretical relationships (RQ4). Research has delivered several quantitative studies that investigate the impact of SOC on both work and health-related outcomes. Here, a holistic SOC model incorporating ICT-related constructs and assumptions represents a promising and needed complementation of the current body of knowledge. To accomplish this, we plan to follow a structured approach comprising a multi-centric survey study in order to test hypotheses derived from the explorative study proposed in this paper. Subsequently, we conduct a data analysis based on structural equation modelling and multivariate statistics. As a result, by shifting from an explorative to a confirmative design, generalizable insights resulting from our research agenda form valuable contributions to both the nursing and IS domain.

References

Ahern, N. R., Ark, P., & Byers, J. (2008). Resilience And Coping Strategies In Adolescents. *Paediatric Nursing*, *20*(10).

Antonovsky, A. (1987). *Unraveling the mystery of health: How people manage stress and stay well*. Jossey-Bass.

Bonkowski, J., Carnes, C., Melucci, J., Mirtallo, J., Prier, B., Reichert, E., Moffatt-Bruce, S., & Weber, R. (2013). Effect of Barcode-assisted Medication Administration on Emergency Department Medication Errors. *Academic Emergency Medicine*, *20*(8), 801–806.

Booth, R. G., Strudwick, G., McBride, S., O'Connor, S., & López, A. L. S. (2021). How the nursing profession should adapt for a digital future. *BMJ*, *373*, n1190.

Brown, J., Pope, N., Bosco, A. M., Mason, J., & Morgan, A. (2020). Issues affecting nurses' capability to use digital technology at work: An integrative review. *Journal of Clinical Nursing*, *29*(15–16), 2801–2819.

Caruso, R., Pittella, F., Zaghini, F., Fida, R., & Sili, A. (2016). Development and validation of the Nursing Profession Self-Efficacy Scale. *International Nursing Review*, *63*(3), 455–464.

Chang, L.-Y., Yu, H.-H., & Chao, Y.-F. C. (2019). The Relationship Between Nursing Workload, Quality of Care, and Nursing Payment in Intensive Care Units. *The Journal of Nursing Research*, *27*(1).

De Georgia, M. A., Kaffashi, F., Jacono, F. J., & Loparo, K. A. (2015). Information Technology in Critical Care: Review of Monitoring and Data Acquisition Systems for Patient Care and Research. *The Scientific World Journal*, *2015*, e727694.

De Leeuw, J. A., Woltjer, H., & Kool, R. B. (2020). Identification of Factors Influencing the Adoption of Health Information Technology by Nurses Who Are Digitally Lagging: In-Depth Interview Study. *Journal of Medical Internet Research*, *22*(8), e15630.

Demiris, G., & Hensel, B. K. (2008). Technologies for an aging society: A systematic review of "smart home" applications. *Yearbook of Medical Informatics*, *17*(01), 33–40.

Dykes, S., & Chu, C. H. (2021). Now more than ever, nurses need to be involved in technology design: Lessons from the COVID-19 pandemic. *Journal of Clinical Nursing*, *30*(7–8), e25–e28.

Fisher, D. M., Ragsdale, J. M., & Fisher, E. C. S. (2019). The Importance of Definitional and Temporal Issues in the Study of Resilience. *Applied Psychology*, *68*(4), 583–620.

Goode, S., & Gregor, S. (2009). Rethinking organisational size in IS research: Meaning, measurement and redevelopment. *European Journal of Information Systems*, *18*(1), 4–25.

Gürdaş Topkaya, S., & Kaya, N. (2015). Nurses' computer literacy and attitudes towards the use of computers in health care: Views of computer use in nursing. *International Journal of Nursing Practice*, *21*(S2), 141–149.

Hack-Polay, D., Mahmoud, A. B., Ikafa, I., Rahman, M., Kordowicz, M., & Verde, J. M. (2022). Steering resilience in nursing practice: Examining the impact of digital innovations and enhanced emotional training on nurse competencies. *Technovation*, 102549.

Hadi-Moghaddam, M., Karimollahi, M., & Aghamohammadi, M. (2021). Nurses' trust in managers and its relationship with nurses' performance behaviors: A descriptive- correlational study. *BMC Nursing*, *20*(132).

Hartmann, S., Weiss, M., Newman, A., & Hoegl, M. (2020). Resilience in the Workplace: A Multilevel Review and Synthesis. *Applied Psychology*, *69*(3), 913–959.

Hendriks, P. H. J., Ligthart, P. E. M., & Schouteten, R. L. J. (2016). Knowledge management, health information technology and nurses' work engagement. *Health Care Management Review*, *41*(3), 256–266.

Herbig, B., Büssing, A., & Ewert, T. (2001). The role of tacit knowledge in the work context of nursing. *Journal of Advanced Nursing*, *34*(5), 687–695.

Hines, S., Wakerman, J., Carey, T. A., Russell, D., & Humphreys, J. (2020). Retention strategies and interventions for health workers in rural and remote areas: A systematic review protocol. *JBI Evidence Synthesis*, *18*(1), 87–96.

Huang, R.-T. (2015). Overcoming invisible obstacles in organizational learning: The moderating effect of employee resistance to change. *Journal of Organizational Change Management*, *28*(3), 356–368.

Ida, H., Miura, M., Komoda, M., Yakura, N., Mano, T., Hamaguchi, T., Yamazaki, Y., Kato, K., & Yamauchi, K. (2009). Relationship between stress and performance in a Japanese nursing organization. *International Journal of Health Care Quality Assurance*, *22*(6), 642–657.

Imison, C., Castle-Clarke, S., Watson, R., & Edwards, N. (2016). *Delivering the benefits of digital health care*. Nuffield Trust.

Jo, M. J. ·, & Sung, M.-H. (2018). Impact of Role Conflict, Self-efficacy, and Resilience on Nursing Task Performance of Emergency Department Nurses. *Korean Journal of Occupational Health Nursing*, *27*(1), 59–66.

Khezri, H., & Abdekhoda, M. (2019). Assessing nurses' informatics competency and identifying its related factors. *Journal of Research in Nursing: JRN*, *24*(7), 529.

Kikuchi, Y., Nakaya, M., Ikeda, M., Okuzumi, S., Takeda, M., & Nishi, M. (2014). Sense of Coherence and Personality Traits Related to Depressive State. *Psychiatry Journal*, *2014*, e738923.

Kim, H.-W., & Kankanhalli, A. (2009). Investigating User Resistance to Information Systems Implementation: A Status Quo Bias Perspective. *MIS Quarterly*, *33*(3), 567–582.

Kleiveland, B., Natvig, G. K., & Jepsen, R. (2015). Stress, sense of coherence and quality of life among Norwegian nurse students after a period of clinical practice. *PeerJ*, *3*, e1286.

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.

Knop, M., Mueller, M., & Niehaves, B. (2021). Investigating the Use of Telemedicine for Digitally Mediated Delegation in Team-Based Primary Care: Mixed Methods Study. *Journal of Medical Internet Research*, *23*(8), e28151.

Koivunen, M., Kontio, R., Pitkänen, A., Katajisto, J., & Välimäki, M. (2013). Occupational Stress and Implementation of Information Technology Among Nurses Working on Acute Psychiatric Wards: Occupational Stress and Implementation of Information Technology Among Nurses Working on Acute Psychiatric Wards. *Perspectives in Psychiatric Care*, *49*(1), 41–49.

Kowitlawkul, Y., Yap, S. F., Makabe, S., Chan, S., Takagai, J., Tam, W. W. S., & Nurumal, M. S. (2019). Investigating nurses' quality of life and work-life balance statuses in Singapore. *International Nursing Review*, *66*(1), 61–69.

Krick, T., Huter, K., Domhoff, D., Schmidt, A., Rothgang, H., & Wolf-Ostermann, K. (2019). Digital technology and nursing care: A scoping review on acceptance, effectiveness and efficiency studies of informal and formal care technologies. *BMC Health Services Research*, *19*(1), 400.

Lanz, J. J., & Bruk-Lee, V. (2017). Resilience as a moderator of the indirect effects of conflict and workload on job outcomes among nurses. *Journal of Advanced Nursing*, *73*(12), 2973–2986.

Laurenza, E., Quintano, M., Schiavone, F., & Vrontis, D. (2018). The effect of digital technologies adoption in healthcare industry: A case based analysis. *Business Process Management Journal*, *24*(5), 1124–1144.

Lin, T.-C. (2014). Mobile Nursing Information System Utilization: The Task-Technology Fit Perspective. *CIN: Computers, Informatics, Nursing*, *32*(3), 129.

Liu, W., Zhao, S., Shi, L., Zhang, Z., Liu, X., Li, L., Duan, X., Li, G., Lou, F., Jia, X., Fan, L., Sun, T., & Ni, X. (2018). Workplace violence, job satisfaction, burnout, perceived organisational support and their effects on turnover intention among Chinese nurses in tertiary hospitals: A cross-sectional study. *BMJ Open*, *8*(6), e019525.

Lou, N. M., Montreuil, T., Feldman, L. S., Fried, G. M., Lavoie-Tremblay, M., Bhanji, F., Kennedy, H., Kaneva, P., & Harley, J. M. (2022). Nurses' and Physicians' Distress, Burnout, and Coping Strategies During COVID-19: Stress and Impact on Perceived Performance and Intentions to Quit. *Journal of Continuing Education in the Health Professions*, *42*(1), e44.

Marć, M., Bartosiewicz, A., Burzyńska, J., Chmiel, Z., & Januszewicz, P. (2018). A nursing shortage—A prospect of global and local policies. *International Nursing Review*, *66*(1), 9–16.

Marques da Rosa, V., Saurin, T. A., Tortorella, G. L., Fogliatto, F. S., Tonetto, L. M., & Samson, D. (2021). Digital technologies: An exploratory study of their role in the resilience of healthcare services. *Applied Ergonomics*, *97*, 103517.

Masanotti, G. M., Paolucci, S., Abbafati, E., Serratore, C., & Caricato, M. (2020). Sense of Coherence in Nurses: A Systematic Review. *International Journal of Environmental Research and Public Health*, *17*(6), 1861.

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist*, *56*(3), 227–238.

Masum, A. K. M., Azad, M. A. K., Hoque, K. E., Beh, L.-S., Wanke, P., & Arslan, Ö. (2016). Job satisfaction and intention to quit: An empirical analysis of nurses in Turkey. *PeerJ*, *4*, e1896.

Matavire, R., & Brown, I. (2013). Profiling grounded theory approaches in information systems research. *European Journal of Information Systems*, *22*(1), 119–129.

Matsuo, M., Suzuki, E., Takayama, Y., Shibata, S., & Sato, K. (2021). Influence of Striving for Work–Life Balance and Sense of Coherence on Intention to Leave Among Nurses: A 6-Month Prospective Survey. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *58*.

Michael, R., & Jenkins, H. J. (2001). Recovery From Work-Related Trauma by Perioperative Nurses: The effects of social and personal resources. *Collegian*, *8*(3), 8–13.

Miyata, C., Arai, H., & Suga, S. (2015). Characteristics of the nurse manager's recognition behavior and its relation to sense of coherence of staff nurses in Japan. *Collegian*, *22*(1), 9–17.

Moore, E. C., Tolley, C. L., Bates, D. W., & Slight, S. P. (2020). A systematic review of the impact of health information technology on nurses' time. *Journal of the American Medical Informatics Association*, *27*(5), 798–807.

Mueller, M., Knop, M., Reßing, C., Freude, H., Oschinsky, F. M., Klein, H. C., & Niehaves, B. (2020). Constituting Factors of a Digitally Influenced Relationship between Patients and Primary Care Physicians in Rural Areas. *Proceedings of the 53rd Hawaii International Conference on System Sciences (HICSS)*.

Niskala, J., Kanste, O., Tomietto, M., Miettunen, J., Tuomikoski, A.-M., Kyngäs, H., & Mikkonen, K. (2020). Interventions to improve nurses' job satisfaction: A systematic review and meta-analysis. *Journal of Advanced Nursing*, *76*(7), 1498–1508.

Oster, N. V., Patterson, D. G., Skillman, S. M., & Frogner, B. K. (2022). *COVID-19 and the Rural Health Workforce: The Impact of Federal Pandemic Funding to Address Workforce Needs*. Center for Health Workforce Studies, University of Washington.

Poncette, A.-S., Mosch, L., Spies, C., Schmieding, M., Schiefenhövel, F., Krampe, H., & Balzer, F. (2020). Improvements in Patient Monitoring in the Intensive Care Unit: Survey Study. *Journal of Medical Internet Research*, *22*(6), e19091.

Pooley, J. A., & Cohen, L. (2010). Resilience: A Definition in Context. *Australian Community Psychologist*, *22*(1), 30–37.

Poon, E. G., Keohane, C. A., Yoon, C. S., Ditmore, M., Bane, A., Levtzion-Korach, O., Moniz, T., Rothschild, J. M., Kachalia, A. B., Hayes, J., Churchill, W. W., Lipsitz, S., Whittemore, A. D., Bates, D. W., & Gandhi, T. K. (2010). Effect of Bar-Code Technology on the Safety of Medication Administration. *New England Journal of Medicine*, *362*(18), 1698–1707.

R Core Team. (2022). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. https://www.R-project.org

Ricciardi, W., Pita Barros, P., Bourek, A., Brouwer, W., Kelsey, T., Lehtonen, L., & Expert Panel on Effective Ways of Investing in Health (EXPH). (2019). How to govern the digital transformation of health services. *European Journal of Public Health*, *29*(Supplement_3), 7–12.

Rubeis, G. (2021). Guardians of humanity? The challenges of nursing practice in the digital age. *Nursing Philosophy*, *22*(2), e12331.

Stock, E. (2017). Exploring salutogenesis as a concept of health and wellbeing in nurses who thrive professionally. *British Journal of Nursing*, *26*(4), 238–241.

Sundberg, K., Nilsson, M., Petersson, L.-M., Kenne Sarenmalm, E., & Langius-Eklöf, A. (2022). The sense of coherence scale in a clinical nursing perspective: A scoping review. *Journal of Clinical Nursing*, *31*(11–12), 1428–1439.

Timmons, S. (2003). Nurses resisting information technology. *Nursing Inquiry*, *10*(4), 257–269.

Törnqvist, J., Törnvall, E., & Jansson, I. (2016). Double documentation in electronic health records. *Nordic Journal of Nursing Research*, *36*(2), 88–94.

van der Colff, J. J., & Rothmann, S. (2009). Occupational stress, sense of coherence, coping, burnout and work engagement of registered nurses in South Africa. *SA Journal of Industrial Psychology*, *35*(1).

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems. *MIS Quarterly*, *37*(1), 21–54.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, *27*(3), 425–478.

Walsh, P., Owen, P. A., Mustafa, N., & Beech, R. (2020). Learning and teaching approaches promoting resilience in student nurses: An integrated review of the literature. *Nurse Education in Practice*, *45*, 102748.

Wu, T.-Y., Fox, D. P., Stokes, C., & Adam, C. (2012). Work-related stress and intention to quit in newly graduated nurses. *Nurse Education Today*, *32*(6), 669–674.

Zadvinskis, I. M., Smith, J. G., & Yen, P.-Y. (2018). Nurses' Experience With Health Information Technology: Longitudinal Qualitative Study. *JMIR Medical Informatics*, *6*(2), e8734.