

Knowledge Management and Resilience in SMEs Sector

Krzysztof Zieba

Gdansk University of Technology, Gdansk, Poland

kzieba@zie.pg.gda.pl

Abstract: Purpose: The aim of this paper is to investigate the role of resilience in surviving major disruptions, such as pandemic or war. This problem is especially vital for small and medium-sized enterprises (SMEs), as they often lack both resources needed for survival during prolonged economic hardship and knowledge management (KM) practices which are useful for developing the necessary business resilience. Methodology: The paper uses literature review approach to investigate the current knowledge on resilience and its dimensions as well as the links between KM, resilience and operational efficiency. Systems Thinking approach is proposed to be used to show the complexity of mechanisms behind those phenomena and the impact they have on business competitiveness in the SMEs sector. Findings: Because of their nature, SMEs were particularly severely hit by the COVID-19 crisis. SMEs now have to adjust to the new reality of the post-crisis phase by developing their business resilience. KM practices prove to offer high potential in resilience creation and resilience maintenance. Specific features of SMEs, if combined with operational agility and resilience, may allow them to successfully face challenges of their turbulent environment. Research limitations: This paper is of a preliminary, conceptual nature. Its further development includes investigation of various aspects of KM relevant to strengthening business resilience in SMEs. More data is still needed to develop and test full Systems Thinking model based on the framework proposed here. Practical implications: SMEs owners and managers may benefit from this paper, as they may use it as a guidance in the process of developing business resilience in their organisations. The insights provided in this paper may be useful for decision makers and also for businesses offering knowledge-based services, offering them a deeper understanding of the presented phenomena and relations between them. Originality/value: The paper is focused on SMEs, which are rarely investigated when it comes resilience creation and benefits it offers. The framework presented here provides important insights, which can be useful to numerous stakeholders.

Keywords: Knowledge Management, Resilience, Smes, COVID-19 Pandemic

1. Introduction

COVID-19 pandemic remains a major global disruption of the XXI century. Its scale was unprecedented (Fernandes, 2020) and its characteristics proved to be very complex (Donthu and Gustafsson, 2020). The pandemic significantly influenced and transformed several aspects of everyday life, education, business operations – to name just a few (van Bavel *et al.*, 2020). It is considered to be an intense example of a black swan event, which had a profound impact on virtually all sectors of economy. Most of them were adversely affected (e.g. healthcare, education, tourism and hospitality) with a few exceptions (e.g. telecommunications) (Ahmad, Kutan and Gupta, 2021). Although the impact of COVID-19 currently fades away, there are still numerous threats to global stability: the war in Ukraine, the instability in the Near East, including the intervention in Gaza zone and the tension between Israel and Iran, as well as the problematic situation between China and Taiwan.

In these turbulent times, the concept of resilience appears to be a critical issue for survival and development of business organisations. The original meaning of this concept, which is over 50 years old, comes from ecology and refers to the ability of an ecosystem to respond to unexpected environmental changes and swiftly return to the original state (Holling, 1973). Resilience became a multi-faceted concept used in a range of scientific disciplines. In the so-called VUCA (Volatility, Uncertainty, Complexity, Ambiguity) world the significance of resilience for all organisations is growing, although there is no one single commonly accepted definition of business resilience nor a universal scale to measure it (Kantur, 2015). Additionally, although small and medium-sized enterprises (SMEs) are often referred to as the backbone of contemporary economies (Cowling *et al.*, 2014), the topic of SMEs resilience is greatly under-researched (Alberti, Ferrario and Pizzurno, 2018).

This papers addresses the following research questions: 1. What is the contribution of resilience to SMEs efficiency? 2. How knowledge management (KM) may be used in SMEs for building their resilience? This paper will aim at answering this question by the application of Systems Thinking theory approach and the usage of Vensim PLE tool. The paper develops as follow. First, the concept of resilience is discussed, particularly in the context of turbulent environment, and SMEs characteristics. Second, the System Thinking approach is discussed and its applicability to analysing complex relationships is justified. Then, the proposed framework of SMEs resilience is presented and explained. In the concluding part of the paper, the role of KM in resilience creation is discussed. The paper is then summarised, theoretical and practical contributions are presented, paper limitations are listed, and avenues for the future research are shown.

2. Knowledge Management and Resilience of SMEs

KM is not so often researched in the context of SMEs. This claim made by Hutchinson and Quintas (2008) remains quite true even today. In the earlier days, SMEs were not expected to possess awareness, abilities and resources to manage knowledge, despite of potential benefits they could gain. Hutchinson and Quintas proved however that SMEs not only manage knowledge in the informal way (without use of the language and concepts of KM and formal KM structures), but some of them also engage in formal KM, although more occasionally. KM in SMEs remains limited and the major focus is on KM implementation, KM perception, and knowledge transfer rather than knowledge identification, knowledge storage/retention, and knowledge utilisation (Durst and Edvardsson, 2012). Those three last issues seem to be particularly applicable when it comes to SMEs resilience.

The concept of resilience is rooted in ecology and for a few decades it remained absent in social sciences. At the beginning of the XXI century first papers on a more general application of resilience were published (Hamel and Välikangas, 2003), including those related to supply chain management. Considering resilience in the context of supply chain management was a response to September 11, 2001 events, which crippled many American companies dependent on their just-in-time discipline. Subsequent events, such as the train bombings in Madrid (March 11, 2004) and the London's transportation system bombings on July 2005 just added more to this picture (Sheffi and Rice, 2005). The real trigger for analysing resilience in a broader economic context, exceeding just supply chain problems, was the financial crisis of 2008/2009. From that time on, resilience research focuses on such research streams, as organisational responses to external threats, organisational reliability, employee strengths, adaptability of business models and designing principles that may reduce supply chain vulnerability and impact of disruptions (Linnenluecke, 2017). It also became evident that contextualisation of the resilience concept must take into account also SMEs. (Dahles and Susilowati, 2015). They are more vulnerable than their bigger counterparts, as they have less resources to tackle the encountered problems. SMEs face recurrent and multifaceted problems ranging from natural disasters and economic crises to market access challenges, political turmoil and institutional failures (Littlewood and Holt, 2018). It is evident that the majority of publications on resilience are focused on event-driven disruptions (like the above-mentioned ones or the latest COVID-19 pandemic) and most of the studies evaluate such event-driven disruptions in the attempt to propose improvements to business resilience (Kantur, 2015). We still lack a more general understanding of the resilience concept that would emerge from those single disruptions (Littlewood and Holt, 2018).

This general understanding of resilience is difficult to achieve for a number of reasons. Firstly, the concept of resilience would differ across various disciplines. In engineering or physical science the feature of resilience is based on the ability of the system to return to the previous, original state after having experienced a disruption (Dahlberg and Guay, 2015). This original state is the equilibrium of the system and in this approach the system has just one equilibrium state. In other sciences, however, resilience is often focused more on adaption. In psychology, resilience is about the ability to achieve positive performance during unfolding disruption, suggesting that multiple equilibria are possible (Linnenluecke, 2017). This "single equilibrium" approach does not seem appropriate for analysing resilience of SMEs, as it is limited to a "machine view" of organisations with oversimplified cause-and-effect dynamics (Tognazzo, Gubitta and Favaron, 2016). The resilience of SMEs should differ from "engineering resilience" (Conz, Denicolai and Zucchella, 2017), as it incorporates adaptability and ability to keep positive performance a mid of continuing disruptions and challenges and does not cling on to the same state of the business, external relations, internal processes, etc. Additionally, the resilience of SMEs may be substantially different from the resilience of large enterprises. It is a common mistake to assume that conceptual frameworks and organisational theories developed by researching large enterprises may be successfully used for SMEs (Ates and Bititci, 2011; Sullivan-Taylor and Branicki, 2011). Small businesses are not "little big businesses" and apart from obvious quantitative differences they also differ in qualitative way from large organisations. For the need of this paper, the SMEs resilience concept is defined as "not just the one about minimising and managing the impact of the disaster, but also about creating the agility needed to adapt to unexpected challenges and the ability to seize opportunity from adversity" (Alberti, Ferrario and Pizzurno, 2018). Both SMEs resilience and also their competitiveness are shaped by three groups of factors: internal – organisational behaviour, managerial characteristics and overall quality; external – globalisation, and enabling – use of technology, generation of capital, location and marketing, and supply chain integration (Gunasekaran, Rai and Griffin, 2011). In particular, creating resilient SMEs requires knowledge retention through a flexible workforce, proper strategic managerial thinking, but also personal relationship, networking ability, organisational structure and people management (Alberti, Ferrario and Pizzurno, 2018).

3. Systems Thinking Approach to Resilience Research

Systems Thinking is a term having a few meanings (Cabrera, Colosi and Lobdell, 2008). It can be treated as a perspective, a language or as a set of tools, which include causal loop diagrams. Systems Thinking is defined as opposite to linear thinking and offers holistic approach to the analysed phenomena. Its possible applications span across various fields and disciplines (Monat and Gannon, 2015). Systems Thinking is particularly useful when dealing with complexity, as it involves uncertainty, perceiving things from various perspectives, lack of a singular “right answer”. Complexity also defies linear logic, leading to various possible outcomes (Kay, 2008).

Systems Thinking approach has already been quite widely used with application to ecology, which is characterised by high level of complexity and interrelations within ecological systems and between them (Hogan and Weathers, 2006; Davis and Stroink, 2016). This wide use of Systems Thinking for investigating ecological issues contributed to gradual adoption of this approach to other scientific areas, such as sustainability and sustainability management (Williams *et al.*, 2017) and broad socio-technical problems (Davis *et al.*, 2014).

Papers that utilise Systems Thinking approach to investigate resilience are relatively scarce. Some of them are of rather general nature, triggered by the COVID-19 pandemic (Hynes *et al.*, 2020; Saulnier *et al.*, 2021). There are also streams of papers focused on community resilience (Mavhura, 2017; Helfgott, 2018), on urban resilience (Connolly, 2018; Robbins, 2022) and supply chain management (Tsolakis, Zisis and Tjahjono, 2023; Wieland *et al.*, 2023). The most promising paper on business resilience research using Systems Thinking draws viewpoints from ecology, physics, sociology, psychology and disaster management to develop a research framework for enterprise resilience (Wright *et al.*, 2012), although it does not adopt the perspective of SMEs.

To sum up, the fundamental systems-thinking perspectives and approaches include: attention to how new knowledge is gained, managed, exchanged, interpreted, integrated, and disseminated, a network-centric approach based on building relations among and between individuals and organizations, the development of models and projections, using a variety of analytic approaches (Leischow *et al.*, 2008). Systems thinking is also perceived as a valuable methodology, particularly suitable for Knowledge Management-related considerations (Rubenstein-Montano *et al.*, 2001; Cavaleri, 2005), offering new ways of thinking and a useful toolbox on different levels and phases of Knowledge Management for practical knowledge users (Gao, Li and Nakamori, 2002). The current economic situation is multifactorial, dynamic and nonlinear, hence compartmental knowledge originating from scientific silos is likely to obstruct understanding of the inter-relations among all the significant variables (Leischow *et al.*, 2008). Therefore, the Systems Thinking approach can be considered as the one offering adequate tools for analysing business operations with respect to resilience, efficiency and the role of KM in shaping their relations.

4. SMEs Resilience in Turbulent Times of Globalisation

Globalisation made business world much more turbulent than ever before. Disruptions resulting from natural and man-made disasters are no longer of local or regional scale, as they are transmitted globally through the system of world economy. Increased complexity in the supply chains result in unexpected problems in production and sales. Those risks cannot be avoided, but they can be mitigated or even successfully for improving business performance used through resilience-building in companies (Yu *et al.*, 2019; Wong *et al.*, 2020). Trying to do so became a top priority for business executives in large organisations and SMEs should follow that path.

As can be seen in Figure 1., the impact of disruption on operational efficiency of businesses depends on how severe disruptions are and how often businesses are hit by disruptions. The frequency of disruptions is growing because organizations live and compete in a world that is increasingly interconnected both socially and technologically, making them prone to the so-called “butterfly effect” which is likely to appear in wide interconnected networks of companies. Disruptions are likely to cripple operational efficiency of businesses, leading to lower competitiveness, losing market shares and even business discontinuation. Positive role of resilience in increasing operational efficiency is not obvious, especially in the short run (Gölgeci, Yıldız and Andersson, 2020). One way of creating resilience is building redundancies in the company. Redundancies would operate as a buffer during a disruption (Disruption Absorption), but building and maintaining them is costly. Those additional costs are likely to lower operational efficiency of a business, leading to losing competitiveness. Another dimension of operational resilience is recoverability. It may be partly based on redundancies representing cost increase, but also – to a greater extent – on flexibility. Unlike redundancies, flexibility yields a number of additional, day-to-day benefits (Sheffi and Rice, 2005).

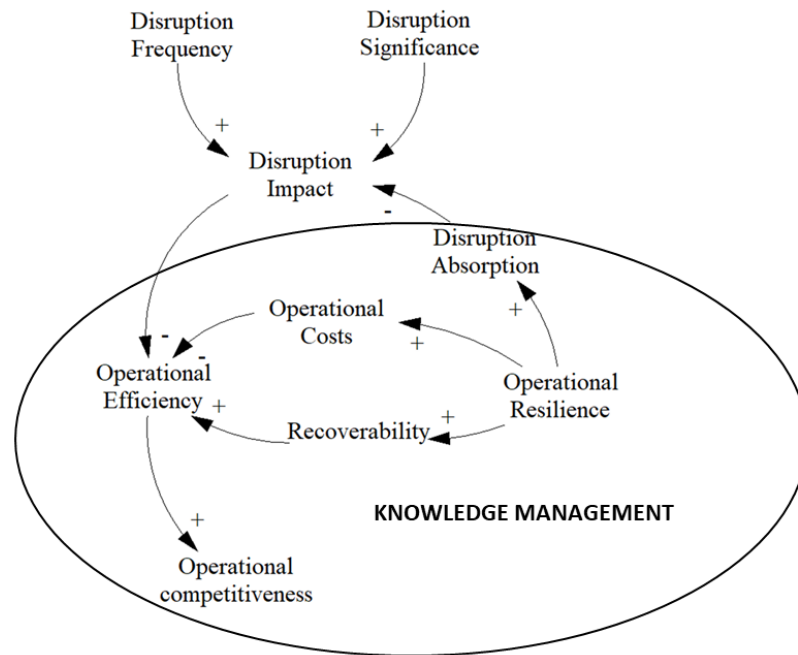


Figure 1: The role of resilience in surviving in turbulent environment (own elaboration using Vensim PLE).

Studies show that both disruption absorption and recoverability have positive, yet unique effects on operational efficiency under varying disruption conditions (Essuman, Boso and Annan, 2020). Although SMEs are more vulnerable to disruptions because of more limited resources, they also have some advantages regarding building resilience. Due to their characteristics they can benefit from less formal procedures and bureaucracy, short decision chains resulting in rapid decision-making, natural flexibility of small and more informal organisation and capacity of fast learning, if only they aspire to operate as a learning organisation (Alberti, Ferrario and Pizzurno, 2018).

5. KM in Resilience Creation

Knowledge is acknowledged as a vital aspect for improving resilience capabilities (FardH and Fani, 2015). As a consequence, Knowledge Management seems to be a very useful tool to build and enhance resilience. In the educational context, Knowledge Management Process, Knowledge Management System Infrastructure, and Knowledge System Quality proved to be effective, resilient strategies that allowed to convert challenges into opportunities during COVID-19 pandemic. In particular, Knowledge Management Process was positively and significantly associated employee commitment and performance, while knowledge sharing, accessibility and application further contributed to increased resilience (Sivagnanam *et al.*, 2023). Higher education institutions are knowledge intensive; their employees – faculty – can be considered as knowledge workers (Bratianu, 2014; Cegarra-Navarro, Garcia-Perez and Bedford, 2020). Therefore, KM practices may be easier to conduct in such a environment. The use of KM practices in SMEs is probably more challenging, but the applicability of the model developed by Sivagnanam (2023) in the context of SMEs is very likely.

In the context of healthcare systems and their response to the COVID-19 pandemic, research suggests that Knowledge Management serves as a significant predictor of organisational resilience and agility. Acquiring, sharing and applying new knowledge results in increased proactivity, adaptivity, agility and resilience (Ibrahim Ismael, Mamdouh El-kholy and Saeed Ahmed Abd-Elrhman, 2021). Those findings corroborate with earlier results obtained in business context, namely in the banking sector. Knowledge creation process proved to enhance resilience capabilities, contributing to improvement in business performance. Knowledge creation and knowledge sharing activities also develop organisational agility and innovativeness (Alharthy, Sohaib and Hawryszkiewicz, 2018).

One of the possible ways that KM may positively influence business resilience is its link to social capital improvement. Recent research suggests that social capital can be a critical resource of both resilience in the times of crises and disruptions (when it is really needed) and also of efficiency under calmer conditions, when resilience is less useful (Sözbilir, 2018; Gölgeci and Kuivalainen, 2020). Being an element of social capital, social

networks also offer avenues for increased mobilization and transfer of knowledge, dissemination of innovative activities, which in turn increase the resilience of companies (Demmer, Vickery and Calantone, 2011).

The resilience of SMEs is constrained by their behavioural and organisational characteristics, accompanied also by limited access to resources. In order to develop the resilience of SMEs, they should place emphasis on soft aspects of change management (including people, organisational and cultural aspects), planning, preparation and embedding phases of the change process, driving the change internally and adopting proactive rather than reactive attitude (Ates and Bititci, 2011). Knowledge management practices may prove to be an invaluable tool for achieving most of those issues.

6. Conclusions

Research on resilience in business context is still rather fragmented. The concept of resilience lacks clear and common definition, measurement scale and theoretical framework. Yet, resilience becomes more and important for contemporary businesses in their struggle to survive and develop in their increasingly competitive and unstable environment. Although SMEs may be perceived as more vulnerable in this respect, they have also their advantages over bigger counterparts, such as less bureaucracy, the possibility of rapid decision-making and rapid communication, as well as shorter processes.

The potential of Knowledge Management in the area of resilience creation and maintenance is high and still not fully researched, especially with regard to SMEs. The aim of this paper is to shed some light on the possible role of Knowledge Management in making SMEs more resilient. The major limitation of the paper is that at this stage of development, the whole model of KM role in SMEs resilience creation is just preliminarily sketched. It will be further developed and completed using causal loop diagrams. Once completed, it will offer food-for-thought for various stakeholders, including SMEs owners and managers, institutions that support small business development and policy makers.

References

- Ahmad, W., Kutan, A. M. and Gupta, S. (2021) 'Black swan events and COVID-19 outbreak: Sector level evidence from the US, UK, and European stock markets', *International Review of Economics & Finance*, 75, pp. 546–557. doi: <https://doi.org/10.1016/j.iref.2021.04.007>.
- Alberti, F. G., Ferrario, S. and Pizzurno, E. (2018) 'Resilience: Resources and strategies of SMEs in a new theoretical framework', *International Journal of Learning and Intellectual Capital*. Inderscience Publishers, 15(2), pp. 165–188. doi: 10.1504/IJLIC.2018.091969.
- Alharthy, A., Sohaib, O. and Hawryszkiewicz, I. (2018) 'The impact of knowledge creation on organizational resilience towards organizational performance', in *Proceedings of the 27th International Conference on Information Systems Development: Designing Digitalization, ISD 2018*. Available at: <https://aisel.aisnet.org/isd2014/proceedings2018/ISDevelopment/10> (Accessed: 8 May 2024).
- Ates, A. and Bititci, U. (2011) 'Change process: A key enabler for building resilient SMEs', *International Journal of Production Research*. Taylor & Francis Group, 49(18), pp. 5601–5618. doi: 10.1080/00207543.2011.563825.
- van Bavel, J. J. et al. (2020) 'COVID-19 pandemic response', *Nature Human Behaviour*. Springer US, 4(May), pp. 460–471. doi: 10.1038/s41562-020-0884-z.
- Bratianu, C. (2014) 'Intellectual capital of the European universities', in *Handbook of research on trends in European higher education convergence*. IGI Global, pp. 24–43.
- Cabrera, D., Colosi, L. and Lobdell, C. (2008) 'Systems thinking', *Evaluation and Program Planning*. Pergamon, 31(3), pp. 299–310. doi: 10.1016/j.evalprogplan.2007.12.001.
- Cavaleri, S. A. (2005) 'Systems Thinking for Knowledge', *World Futures*. Routledge, 61(5), pp. 378–396. doi: 10.1080/026040290500606.
- Cegarra-Navarro, J.-G., Garcia-Perez, A. and Bedford, D. (2020) 'Contextual Enablers and Behaviour Outputs for Action of Knowledge Workers', *International Journal of Economics and Management Engineering*, 14(12), p. 7.
- Connolly, J. J. T. (2018) 'From Systems Thinking to Systemic Action: Social Vulnerability and the Institutional Challenge of Urban Resilience', *City and Community*. Blackwell Publishing Ltd, 17(1), pp. 8–11. doi: 10.1111/CICO.12282/ASSET/CICO.12282.FP.PNG_V03.
- Conz, E., Denicolai, S. and Zucchella, A. (2017) 'The resilience strategies of SMEs in mature clusters', *Journal of Enterprising Communities*. Emerald Group Publishing Ltd., 11(1), pp. 186–210. doi: 10.1108/JEC-02-2015-0015.
- Cowling, M., Liu W., Ledger A., N Zhang N. (2014) 'What really happens to small and medium-sized enterprises in a global economic recession? UK evidence on sales and job dynamics', <http://dx.doi.org/10.1177/0266242613512513>. SAGE PublicationsSage UK: London, England, 33(5), pp. 488–513. doi: 10.1177/0266242613512513.
- Dahlberg, R. and Guay, F. (2015) 'Creating resilient SMEs: is business continuity management the answer?', in *WIT Transactions on The Built Environment*. WIT Press, pp. 975–984. doi: 10.2495/sd150852.

- Dahles, H. and Susilowati, T. P. (2015) 'Business resilience in times of growth and crisis', *Annals of Tourism Research*. Pergamon, 51, pp. 34–50. doi: 10.1016/J.ANNALS.2015.01.002.
- Davis, A. C. and Strohink, M. L. (2016) 'The Relationship between Systems Thinking and the New Ecological Paradigm', *Systems Research and Behavioral Science*. John Wiley & Sons, Ltd, 33(4), pp. 575–586. doi: 10.1002/sres.2371.
- Davis, M. C., Challenger R., Jayewardene D.N.W., Clegg C.W. (2014) 'Advancing socio-technical systems thinking: A call for bravery', *Applied Ergonomics*. Elsevier, 45(2), pp. 171–180. doi: 10.1016/J.APERGO.2013.02.009.
- Demmer, W. A., Vickery, S. K. and Calantone, R. (2011) 'Engendering resilience in small-and medium-sized enterprises (SMEs): A case study of Demmer Corporation', *International Journal of Production Research*. Taylor & Francis Group, 49(18), pp. 5395–5413. doi: 10.1080/00207543.2011.563903.
- Donthu, N. and Gustafsson, A. (2020) 'Effects of COVID-19 on business and research', *Journal of business research*. 2020/06/09. Elsevier Inc., 117, pp. 284–289. doi: 10.1016/j.jbusres.2020.06.008.
- Durst, S. and Edvardsson R. I. (2012), "Knowledge management in SMEs: a literature review", *Journal of Knowledge Management*, Vol. 16 No. 6, pp. 879–903. <https://doi.org/10.1108/13673271211276173>
- Essuman, D., Boso, N. and Annan, J. (2020) 'Operational resilience, disruption, and efficiency: Conceptual and empirical analyses', *International Journal of Production Economics*, 229, p. 107762. doi: <https://doi.org/10.1016/j.ijpe.2020.107762>.
- FardH, D. and Fani, A. A. (2015) 'Knowledge management and organizational resilience in Iranian public organizations', in *Information and knowledge Management*, pp. 32–43.
- Fernandes, N. (2020) *Economic effects of coronavirus outbreak (COVID-19) on the world economy*, SSRN Electronic Journal, ISSN 1556-5068, Elsevier BV,.
- Gao, F., li, M. and Nakamori, Y. (2002) 'Systems thinking on knowledge and its management: Systems methodology for knowledge management', *Journal of Knowledge Management*. MCB UP Ltd, 6(1), pp. 7–17. doi: 10.1108/13673270210417646.
- Gölgeci, I. and Kuivalainen, O. (2020) 'Does social capital matter for supply chain resilience? The role of absorptive capacity and marketing-supply chain management alignment', *Industrial Marketing Management*. Elsevier, 84, pp. 63–74. doi: 10.1016/j.indmarman.2019.05.006.
- Gölgeci, I., Yildiz, H. E. and Andersson, U. (2020) 'The rising tensions between efficiency and resilience in global value chains in the post-COVID-19 world', *Transnational Corporations*, 27(2), pp. 127–141. doi: 10.18356/99b1410f-en.
- Gunasekaran, A., Rai, B. K. and Griffin, M. (2011) 'Resilience and competitiveness of small and medium size enterprises: An empirical research', *International Journal of Production Research*. Taylor & Francis Group, 49(18), pp. 5489–5509. doi: 10.1080/00207543.2011.563831.
- Hamel, G. and Välikangas, L. (2003) 'The Quest for Resilience', *Harvard Business Review*, pp. 355–358. Available at: <https://revistas.comillas.edu/index.php/revistaicade/article/view/7226> (Accessed: 6 May 2024).
- Helfgott, A. (2018) 'Operationalising systemic resilience', *European Journal of Operational Research*. North-Holland, 268(3), pp. 852–864. doi: 10.1016/J.EJOR.2017.11.056.
- Hogan, K. and Weathers, K. C. (2006) 'Psychological and Ecological Perspectives on the Development of Systems Thinking', in *Understanding Urban Ecosystems*. Springer, New York, NY, pp. 233–260. doi: 10.1007/0-387-22615-x_15.
- Holling, C. S. (1973) 'Resilience and Stability of Ecological Systems', *Annual Review of Ecology, Evolution, and Systematics*. Annual Reviews, 4(Volume 4, 1973), pp. 1–23. doi: 10.1146/ANNUREV.ES.04.110173.000245.
- Hutchinson, V., & Quintas, P. (2008). Do SMEs do Knowledge Management?: Or Simply Manage what they Know? *International Small Business Journal*, 26(2), 131–154. <https://doi.org/10.1177/0266242607086571>
- Hynes, W. Trump B., Love P., I Linkov I. (2020) 'Bouncing forward: a resilience approach to dealing with COVID-19 and future systemic shocks', *Environment Systems and Decisions*. Springer, 40(2), pp. 174–184. doi: 10.1007/s10669-020-09776-x.
- Ibrahim Ismael, Z., Mamdouh El-kholy, S. and Saeed Ahmed Abd-Elrhaman, E. (2021) 'Knowledge Management as a predictor of Organizational Resilience and Agility', *Egyptian Journal of Health Care*. Egypts Presidential Specialized Council for Education and Scientific Research, 12(4), pp. 1397–1412. doi: 10.21608/ejhc.2021.209025.
- Kantur, D. (2015) 'Measuring Organizational Resilience: A Scale Development', *Pressacademia*. PressAcademia, 4(3), pp. 456–456. doi: 10.17261/pressacademia.2015313066.
- Kay, J. J. (2008) 'An introduction to systems thinking', *The ecosystem approach: Complexity, uncertainty, and managing for sustainability*. Columbia University Press: New York, NY, USA, pp. 3–13.
- Leischow, S. J., Best A., Trochim W.M., Clark P.I., Gallagher R.S., Marcus S.E., Matthews E. et al. (2008) 'Systems thinking to improve the public's health', *American journal of preventive medicine*. Elsevier, 35(2), pp. S196–S203.
- Linnenluecke, M. K. (2017) 'Resilience in Business and Management Research: A Review of Influential Publications and a Research Agenda', *International Journal of Management Reviews*. John Wiley & Sons, Ltd, 19(1), pp. 4–30. doi: 10.1111/IJMR.12076.
- Littlewood, D. and Holt, D. (2018) 'Social enterprise resilience in sub-Saharan Africa', *Business Strategy and Development*. John Wiley & Sons, Ltd, 1(1), pp. 53–63. doi: 10.1002/bsd2.11.
- Mavhura, E. (2017) 'Applying a systems-thinking approach to community resilience analysis using rural livelihoods: The case of Muzarabani district, Zimbabwe', *International Journal of Disaster Risk Reduction*. Elsevier, 25, pp. 248–258. doi: 10.1016/J.IJDRR.2017.09.008.
- Monat, J. P. and Gannon, T. F. (2015) 'What is systems thinking? A review of selected literature plus recommendations', *American Journal of Systems Science*, 4(1), pp. 11–26.

- Robbins, M. (2022) 'Urban Resilience: Moving from Idealism to Systems Thinking', *The Palgrave Encyclopedia of Urban and Regional Futures*. Palgrave Macmillan, Cham, pp. 2066–2071. doi: 10.1007/978-3-030-87745-3_17.
- Rubenstein-Montano, B., Liebowitz J., Buchwalter J., McCaw D., Newman B., Rebeck K. (2001) 'A systems thinking framework for knowledge management', *Decision Support Systems*, 31(1), pp. 5–16. doi: [https://doi.org/10.1016/S0167-9236\(00\)00116-0](https://doi.org/10.1016/S0167-9236(00)00116-0).
- Saulnier, D. D. et al. (2021) 'A health systems resilience research agenda: moving from concept to practice', *BMJ Global Health*. BMJ Specialist Journals, 6(8), p. e006779. doi: 10.1136/bmjgh-2021-006779.
- Sheffi, Y. and Rice, J. B. (2005) 'A supply chain view of the resilient enterprise', *MIT Sloan Management Review*. Available at: <https://sloanreview.mit.edu/article/a-supply-chain-view-of-the-resilient-enterprise/> (Accessed: 6 May 2024).
- Sivagnanam, P., Pillai A.R., Elangovan R., Parayitam S. (2023) 'Knowledge management process, infrastructure, and system quality as resilient strategies to respond to COVID-19 pandemic challenges: Evidence from higher educational institutions in India', *Knowledge and Process Management*. John Wiley & Sons, Ltd, 30(4), pp. 333–354. doi: 10.1002/kpm.1722.
- Sözbilir, F. (2018) 'The interaction between social capital, creativity and efficiency in organizations', *Thinking Skills and Creativity*. Elsevier, 27, pp. 92–100. doi: 10.1016/j.tsc.2017.12.006.
- Sullivan-Taylor, B. and Branicki, L. (2011) 'Creating resilient SMEs: Why one size might not fit all', *International Journal of Production Research*. Taylor & Francis Group, 49(18), pp. 5565–5579. doi: 10.1080/00207543.2011.563837.
- Tognazzo, A., Gubitta, P. and Favaron, S. D. (2016) 'Does slack always affect resilience? A study of quasi-medium-sized Italian firms', *Entrepreneurship and Regional Development*. Routledge, 28(9–10), pp. 768–790. doi: 10.1080/08985626.2016.1250820.
- Tsolakis, N., Zissis, D. and Tjahjono, B. (2023) 'Scrutinising the interplay between governance and resilience in supply chain management: A systems thinking framework', *European Management Journal*. Pergamon, 41(1), pp. 164–180. doi: 10.1016/j.emj.2021.11.001.
- Wieland, A., Stevenson M., Melnyk S.A., Davoudi S., Schultz L. (2023) 'Thinking differently about supply chain resilience: what we can learn from social-ecological systems thinking', *International Journal of Operations and Production Management*. Emerald Publishing, 43(1), pp. 1–21. doi: 10.1108/IJOPM-10-2022-0645.
- Williams, A., Kennedy S., Philipp F., Whiteman G. (2017) 'Systems thinking: A review of sustainability management research', *Journal of Cleaner Production*, 148, pp. 866–881. doi: <https://doi.org/10.1016/j.jclepro.2017.02.002>.
- Wong, C. W. Y., Lirn T.C., Yang C.C., Shang K.C. (2020) 'Supply chain and external conditions under which supply chain resilience pays: An organizational information processing theorization', *International Journal of Production Economics*. Elsevier, 226, p. 107610. doi: 10.1016/j.ijpe.2019.107610.
- Wright, C., Kiparoglou V., Williams M., Hilton J. (2012) 'A framework for resilience thinking', in *Procedia Computer Science*. Elsevier, pp. 45–52. doi: 10.1016/j.procs.2012.01.012.
- Yu, W., Jacobs M.A., Chavez R., Yang J. (2019) 'Dynamism, disruption orientation, and resilience in the supply chain and the impacts on financial performance: A dynamic capabilities perspective', *International Journal of Production Economics*. Elsevier, 218, pp. 352–362. doi: 10.1016/J.IJPE.2019.07.013.