



## ROWE SCHOOL OF BUSINESS

[Beaubien, L., Conrad, C., Music, J., Toze, S. \(2021\). Evaluating simplified web interfaces of risk models for clinical use: Pilot survey study. \*JMIR Formative Research\*, 5 \(7\), 22110.](#)

**Background:** In this pilot study, we investigated sociotechnical factors that affect intention to use a simplified web model to support clinical decision making. **Objective:** We investigated factors that are known to affect technology adoption using the unified theory of acceptance and use of technology (UTAUT2) model. The goal was to pilot and test a tool to better support complex clinical assessments. **Methods:** Based on the results of a previously published work, we developed a web-based mobile user interface, WebModel, to allow users to work with regression equations and their predictions to evaluate the impact of various characteristics or treatments on key outcomes (e.g., survival time) for chronic obstructive pulmonary disease. The WebModel provides a way to combat information overload and more easily compare treatment options. It limits the number of web forms presented to a user to between 1 and 20, rather than the dozens of detailed calculations typically required. The WebModel uses responsive design and can be used on multiple devices. To test the WebModel, we designed a questionnaire to probe the efficacy of the WebModel and assess the usability and usefulness of the system. The study was live for one month, and participants had access to it over that time. The questionnaire was administered online, and data from 674 clinical users who had access to the WebModel were captured. SPSS and R were used for statistical analysis. **Results:** The regression model developed from UTAUT2 constructs was a fit. Specifically, five of the seven factors were significant positive coefficients in the regression: performance expectancy ( $\beta=.2730$ ;  $t=7.994$ ;  $P<.001$ ), effort expectancy ( $\beta=.1473$ ;  $t=3.870$ ;  $P=.001$ ), facilitating conditions ( $\beta=.1644$ ;  $t=3.849$ ;  $P<.001$ ), hedonic motivation ( $\beta=.2321$ ;  $t=3.991$ ;  $P<.001$ ), and habit ( $\beta=.2943$ ;  $t=12.732$ ). Social influence was not a significant factor, while price value had a significant negative influence on intention to use the WebModel. **Conclusions:** Our results indicate that multiple influences impact positive response to the system, many of which relate to the efficiency of the interface to provide clear information. Although we found that the price value was a negative factor, it is possible this was due to the removal of health workers from purchasing decisions. Given that this was a pilot test, and that the system was not used in a clinical setting, we could not examine factors related to actual workflow, patient safety, or social influence. This study shows that the concept of a simplified WebModel could be effective and efficient in reducing information overload in complex clinical decision making. We recommend further study to test this in a clinical setting and gather qualitative data from users regarding the value of the tool in practice.

[Beagan, B.L., Mohamed, T., Brooks, K., Waterfield, B., Weinberg, M. \(2021\). Microaggressions experienced by LGBTQ academics in Canada: "just not fitting in... it does take a toll". \*International Journal of Qualitative Studies in Education\*, 34 \(3\), 197-212.](#)

Given contemporary attention to diversity and inclusion on Canadian university campuses, and given human rights protections for sexual orientation and gender identity, it is tempting to believe that marginalization is a thing of the past for lesbian, gay, bisexual, transgender and queer (LGBTQ) academics. Our qualitative study ( $n = 8$ ), focusing on everyday experiences rather than overt discrimination, documents numerous microaggressions, the often-unintended interactions that convey messages of marginality. With colleagues, students and administrators, participants reported isolation, tokenism, invisibility, hyper-visibility, dismissal, exoticization, and lack of institutional support. Maintaining constant vigilance and caution was taxing. The everyday microaggressions that lead to isolation and a sense of disease in pervasively cisgender-normative and heteronormative institutions are

very difficult to challenge, as they are not the kinds of experiences anti-discrimination policies and procedures are designed to address.

McManus, J.F., **Carvalho, S.W., Trifts, V.** (2021). The role of brand personality in the formation of consumer affect and self-brand connection. *Journal of Product and Brand Management*.

Purpose: This study aims to explore the role of brand personality traits in explaining how different levels of brand favorability evoke affect from and forge connections to consumers.

Design/methodology/approach: The authors used a quantitative approach consisting of within-subjects (Study 1) and between-subjects (Study 2) experimental designs. Mediation analyses were tested using OLS regression with the MEMORE and PROCESS macros. Findings: Findings suggest increases in brand excitement and sincerity to be related to differences in positive affect evoked by favorable and unfavorable brands; decreases in brand sincerity to be related to differences in negative affect between favorable and unfavorable brands (Study 1); brand competence and excitement to be related to the relationship between brand favorability and self-brand connection; and brand competence and excitement to best distinguish favorable brands from unfavorable brands (Study 2). Originality/value: These results support the importance of brand personality traits that are considered to be universally positive and provide managers with an initial roadmap for which brand personality traits should be prioritized when communicating with consumers

Zhang, Q., **Chen, J., Chen, B.** (2021). Information strategy in a supply chain under asymmetric customer returns information. *Transportation Research Part E: Logistics and Transportation Review*, 155, 102511.

We develop a model for a supply chain with a manufacturer and a retailer facing customer returns, in which information about the rate of customer returns is obtained and held asymmetrically. The retailer implements a full refund policy and accepts returns, collecting and retaining data on the rate of returns. The manufacturer is uninformed about the returns rate. The manufacturer has four strategies as to returns rate information: not acquiring the information, acquiring the information through a side payment contract, offering a buyback policy in order to participate in the returns process, or encroaching with a direct channel. We identify the manufacturer's optimal information strategy and discuss the retailer's preferences. We also identify win-win outcomes for the manufacturer and the retailer. We find that a buyback policy helps the manufacturer to obtain returns rate information for free when the salvage value is the same for the manufacturer and the retailer. When the manufacturer's salvage value is relatively low, there always exists a region where the manufacturer does not try to acquire the information. The retailer may benefit from the cases in which the manufacturer does not acquire the information, adopts a side payment contract, or institutes a buyback policy, but the retailer is always worse off from the manufacturer's channel encroachment strategy. Both the manufacturer and the retailer may have consistent preferences as to the manufacturer's strategy.

Li, D., **Chen, J., Liao, Y.** (2021). Outsourcing strategy in the presence of the customer returns. *International Journal of Production Economics*, 240, 108217.

In this paper, we examine a manufacturer's choice of outsourcing contractor, either a competing contractor or a non-competing contractor. Both the manufacturer and the competing contractor (which also produces a product in its own brand) face customer returns. We find that the manufacturer's optimal outsourcing strategy depends strongly on two factors: the efficiency of production and sale of its brand relative to that of the competing contractor in its own brand, and the ratio of the qualities of the two brands. The competing contractor, on the other hand, always prefers to produce for the

manufacturer. Interestingly, we find that when the manufacturer chooses to outsource to the non-competing contractor, both the wholesale and retail prices of the manufacturer's product decrease, while they increase if the competing contractor is chosen. In addition, the competing contractor may be chosen even if it charges a higher wholesale price than the non-competing contractor does. We find that the manufacturer and the competing contractor should offer money-back guarantees if they can efficiently recover value from any returns. We further show that when a non-competing contractor is chosen, money-back guarantees offered by the manufacturer and the competing contractor can benefit at least one firm and may even achieve a win-win situation. When the competing contractor is chosen, both the manufacturer and the competing contractor can either benefit (Pareto improvement) or suffer (prisoner's dilemma) from money-back guarantees. These results are different from those in existing studies in the literature.

Wang, L., **Chen, J.**, Song, H. (2021). Marketplace or reseller? Platform strategy in the presence of customer returns. *Transportation Research Part E: Logistics and Transportation Review*, 153, 102452.

This paper examines the selling strategy of an internet platform retailer in the presence of customer returns. A supplier may sell its product through the platform retailer and also through its own (direct) channel. The platform retailer may either be a reseller of the supplier's product or a marketplace (charging a commission to provide platform services to the supplier, who sells the product through the platform). When the platform retailer is a reseller it offers a money-back guarantee (MBG) returns policy; when it is a marketplace, it requires that the supplier offer the MBG on sales through the marketplace. We identify the conditions under which the supplier should also offer an MBG in the direct channel. We identify the platform retailer's optimal selling strategy (as marketplace or reseller) and the associated conditions. We show that the platform retailer should choose a reselling strategy if the selling efficiencies in both channels are either significantly different or sufficiently close, and otherwise the platform retailer should choose a marketplace strategy. The regions that achieve win-win for both supply chain members are identified.

Li, D., **Chen, J.**, Liao, Y. (2021). Optimal decisions on prices, order quantities, and returns policies in a supply chain with two-period selling. *European Journal of Operational Research*, 290 (3), 1063-1082.

Selling products in a regular period and a markdown period, in the presence of customer returns, is common practice in the retailing industry. It is critical for the retailer to manage returns by choosing appropriate returns policies for the two periods. This paper examines the retailer's customer returns policy strategy, and pricing and ordering decisions, in a supply chain selling seasonal products over two periods. The manufacturer is a Stackelberg pricing leader and sets wholesale prices at the beginning of each period. The retailer may carry over both returns and strategic inventory of new products from the regular period to the markdown period; we show that if the holding cost on new products is low it carries over strategic inventory; it also carries returns to the markdown period, if it offers a Money-Back Guarantee in the regular period. Interestingly, we find that customer returns can serve as a substitute for inventory, and the retailer is less likely to carry strategic inventory from the first period to the second when it offers an MBG returns policy, as compared to when it offers a no-refund policy. We also show that an MBG returns policy is not always a dominant returns strategy for the retailer, if it has the option to carry strategic inventory. We identify the conditions under which either a no-refund policy or an MBG over two periods can lead to a Pareto improvement for both the retailer and the manufacturer.

Sun, X., Tang, W., Zhang, J., **Chen, J.** (2021). The impact of quantity-based cost decline on supplier encroachment. *Transportation Research Part E: Logistics and Transportation Review*, 147, 102245.

We study a supply chain in which a supplier with encroachment capability and quantity-based cost decline sells through a retailer with demand information advantage. By solving a signaling game, we find that cost decline increases the possibility of order distortion. The obtained results also show that without encroachment, both supply chain members are better off from cost decline; with encroachment, cost decline always hurts the retailer and benefits the supplier only if the direct selling cost is not very high. In addition, encroachment benefits the supplier when the direct selling cost or the cost decline efficiency is relatively low, and benefits the retailer when the direct selling cost is sufficiently high. Finally, we discuss different information structures and obtain some information management insights.

Sun, M., **Chen, J.**, Tian, Y., Yan, Y. (2021). The impact of online reviews in the presence of customer returns. *International Journal of Production Economics*, 232, 107929.

We develop a duopoly model to examine how online reviews influence the decisions of two competing online sellers who sell products of differentiated quality under different returns policies. We derive the competing sellers' optimal decisions on price and returns policy with and without online reviews, and we find that online reviews have greater impact on the high-quality seller than on the low-quality seller. If the salvage value of the product is relatively low, the seller has less opportunity to benefit from online reviews when it offers an MBG, as compared to a no-refund policy. The impact of online reviews on the competition between the two sellers has a "symmetric effect area," where reviews may either weaken or intensify the price competition between the two sellers when they both offer a no-refund policy, but always intensify the competition if they both offer an MBG. We have identified the conditions under which online reviews lead to a win-win, or benefit one seller, or present a prisoner's dilemma for the two online sellers. We also show that MBGs at both sellers help mitigate the prisoner's dilemma if the net salvage value at both sellers is sufficiently high.

Liu, Z., **Chen, J.**, Diallo, C., Venkatadri, U. (2021). Pricing and production decisions in a dual-channel closed-loop supply chain with (re)manufacturing. *International Journal of Production Economics*, 232, 107935.

The development of information technologies and e-commerce has allowed many companies to set up online platforms to sell their products in dual-channel supply chain (SC) networks. The double competition between new and remanufactured products within channels and across competing channels affects manufacturer and retailer pricing decisions. However, the current state of the literature shows a gap in the modelling and analysis of a dual-channel SC with both cross-channel competition and channel costs. To fill this gap, this paper develops a model for a CLSC in which the manufacturer sells new products through a retail channel and also directly through its online channel. The manufacturer may also sell remanufactured products in its online direct channel if it decides to produce them. The results indicate that: (i) the manufacturer's production and optimal pricing strategies depend on both production and channel selling costs; (ii) remanufacturing is not considered by the manufacturer when the unit manufacturing cost is sufficiently low and the retailer's channel cost is sufficiently high; (iii) the introduction of remanufacturing hurts the retailer's profit only when the unit manufacturing cost is sufficiently high; and (iv) selling the new product online mitigates the effect of remanufacturing on the retailer, and thus a high customer's acceptance of the remanufactured product can benefit the retailer.

Zhao, H., **Chen, J.**, Ai, X. (2021). Contract strategy in the presence of chain to chain competition *International Journal of Production Research*.

This paper studies contract strategy for two competing supply chains selling a substitutable product under demand uncertainty. Each supply chain consists of a risk-neutral manufacturer and a risk-averse retailer. As Stackelberg leader in each supply chain, each manufacturer needs to decide which type of contract to provide to its retailer—a revenue-sharing contract or a wholesale price contract. We identify the conditions under which each type of contract should be offered in a competitive market, and which type of contract is preferred by manufacturers only, or by both manufacturers and retailers. We show that wholesale price contracts may be a better choice for manufacturers, to mitigate fierce chain-to-chain competition. Wholesale price contracts are preferred by the manufacturers over revenue-sharing contracts when the price competition is moderate and demand variation is significant. A revenue-sharing contract is the dominant choice for both the manufacturers and the retailers when the price competition is weak and demand uncertainty is low, as long as a revenue-sharing ratio is negotiated in a proper range, a win-win outcome for all supply chain members.

Sun, F., Yang, H., **Chen, J.**, Wang, F. (2021). Disclosure of quality preference-revealing information in a supply chain with competitive products. *Annals of Operations Research*.

We examine price setting and the decision to disclose quality preference-revealing information in a supply chain with two competing manufacturers supplying two quality-differentiated products to a common retailer. Consumers have complete knowledge of product quality but are uncertain about how the quality will match their own preferences. We study who should provide preference-revealing information to help consumers understand their own quality preferences, and how such information disclosure affects horizontal and vertical competitions in the supply chain. We show that the manufacturer with a higher unit quality production cost has a higher incentive to provide such information, and we show how each supply chain member sets its information policy. The role of information releaser will switch from an upstream member (a manufacturer) to the downstream member (the retailer) as the market information level (the consumer's degree of informativeness before disclosure) increases. Information disclosure softens both horizontal and vertical competitions in the supply chain. We extend our model to examine the case in which the two manufacturers make simultaneous decisions, and the case when a supply chain member incurs a cost for implementing information disclosure.

Chen, W., **Chen, J.**, Ma, Y. (2021). Renewable energy investment and carbon emissions under cap-and-trade mechanisms. *Journal of Cleaner Production*, 278, 123341.

This paper develops a model to examine the impacts of cap-and-trade mechanisms on the decisions of a utility firm when it invests in renewable energy and has an existing conventional energy source. Three cap-and-trade mechanisms are considered: No cap-and-trade Mechanism (NM), Grandfathering Mechanism (GM), and Benchmarking Mechanism (BM). We find that the utility firm invests more in renewable energy under either a GM or a BM than that under NM. As compared to GM, the utility firm under the BM invests more in renewable energy, while at the same time it generates more carbon emissions. We also show that investment in renewable energy does not necessarily reduce carbon emissions. When the government sets the unit carbon quota appropriately, however, BM can not only achieve a reduction in carbon emissions, but also ensure that electricity demand will not decrease. The implementation of BM can make the utility firm invest most heavily in renewable energy, while the implementation of GM will produce the lowest carbon emissions. When either a GM or a BM is implemented under a lenient unit carbon quota (or total carbon quota), the utility firm can be more profitable. The study provides some new management insights for the policy-maker.

Wang, L., **Chen, J.**, Song, H. (2021). Manufacturer's channel strategy with retailer's store brand. *International Journal of Production Research*, 59 (10), 3042-3061.

This paper examines the manufacturer's channel strategy as it considers introducing an online channel to sell its own national brand (NB) product, when the bricks-and-mortar retailer sells both the NB and its own lower-quality store brand (SB) product. The manufacturer is motivated to introduce an online channel when the customers' 'hassle cost' of shopping online is relatively low and their transportation cost is relatively high. However, our results also demonstrate that when the online shopping hassle cost is high and the transportation cost is low, and even when there are very few sales in the online channel, the online-sales strategy can still contribute positively to the manufacturer's profit. The introduction of the online channel by the manufacturer may result in a win-win situation for the manufacturer and the retailer. As a corollary effect, when the retailer is able to determine the SB quality, it should position the SB at a lower quality level to avoid competition with the manufacturer's online channel.

Zhang, Q., **Chen, J.**, Lin, J. (2021). Interaction between innovation choice and market-entry timing in a competitive fashion supply chain. Accepted by *Journal of Production Research*.

We consider a duopoly in which a premium firm (Firm 1) competes with a regular firm (Firm 2). They launch a new fashion product, adopting one of two types of innovation, qualitative or non-qualitative, which offer different levels of market acceptance and uncertainty. We consider two groups of fashion consumers, snobs and conformists (defined by preference for exclusivity or conformity). We first examine the case in which the premium firm commits to entering the market first and chooses its type of innovation, and then the regular firm decides on market-entry timing and innovation type. The price game and the strategy interaction between the two firms are examined. We show that consumers' exclusivity and conformity positively impact the optimal decisions of the two firms when the initial market share of snobs is large. When its market-share loss due to late entry is sufficiently high, Firm 1 may prefer a non-qualitative innovation under certain identified conditions; otherwise, it always prefers a qualitative innovation. Firm 2 always benefits from Firm 1's choice of qualitative rather than non-qualitative innovation. We further discuss the strategy interaction when the premium firm commits to late market entry.

Bungay, V., Guta, A., Varcoe, C., Slemon, A., Manning, E., **Comber, S.**, Perri, M. (2021). Gaps in health research related to sex work: an analysis of Canadian health research funding. *Critical Public Health*.

Public health is tasked with addressing the urgent global priority of promoting the health and human rights of adults engaged in sex work and research is critical to support this endeavor. 'What' is studied, 'how' research is done, and 'who' is centered in this research is reflected in how research funding is allocated. In this article, we interrogate funding allocation for sex work-related health research in Canada. Drawing on critical perspectives aimed at illustrating how stigma operates in society, we examine operating grants (N = 64) awarded by the federal health research funding agency between 2003 and 2020. We find that sex workers' health is problematized disproportionately in a street marketplace context that centers on HIV and sexually transmitted infections. Limited work attends to the socio-structural context of sex work and instead perpetuates stigmatizing narratives about sex work. Public health intervention studies are rare, presenting a barrier for implementing and evaluating evidence-based health promotion strategies. Notably, the research projects were conducted by a small number of highly networked, geographically clustered researchers, illustrating gaps in research that considers the complexity of sex work. We propose that it is essential to consider funding as a process that may be limiting the range of health issues being addressed and privileging a small community of

researchers, which can inadvertently serve to worsen health inequities among some sex work communities. Researchers and funding bodies may draw on this analysis to inform a research agenda that meaningfully supports the health, safety, and well-being of sex workers in Canada and globally.

**Comber, S., Wilson, L., Kelly, S., McCay-Peet, L. (2021).** Physician leaders' cross-boundary use of social media: what are the implications in the current COVID-19 environment? *Leadership in Health Services*, 34 (4), 462-484.

**Purpose:** The purpose is to better understand social media (SM) factors that physician leaders need to consider as they adapt their cross-boundary practices to engage with colleagues and patients. First, this study explores why SM is being used by physicians to cross horizontal (physician to physician) and stakeholder (physician to patient) boundaries prior to COVID-19. Secondly, based on the studies reviewed, this study provides insights on the practical SM implications for physician leaders working in the COVID-19 environment to actively enhance their practices, reduce public confusion and improve patient care, thus informing health-care practices. **Design/methodology/approach:** A systematic literature review was used to conduct a structured transparent overview of peer-reviewed articles that describe physicians' use of cross-boundary SM across several disciplines (e.g. health, information science). As a baseline assessment prior to COVID-19, the review synthesized 47 articles, identified and selected from six databases and Novanet. It used NVivo 12 to thematical code the articles, leading to the emergence of four broad factors that influence SM use. **Findings:** A key reason noted in the literature for physicians' use of SM to cross horizontal boundaries is to share knowledge. Regarding stakeholder boundaries, the most cited reasons are to improve patients' health and encourage behavioural changes. Insights garnered on the practical SM implications include the need for physicians to be stronger leaders in presenting trustworthy and consistent health information to the public and peers. As role models for the effective use of SM tools, physician leaders can mentor and coach their colleagues and counterparts. **Research limitations/implications:** As this was a literature review, the authors did not collect primary data to further explore this rapidly changing and dynamic SM world. Next steps could include a survey to determine, first, how physicians currently use SM in this COVID-19 environment and, second, how they could leverage it for their work. Findings from this survey will help us better understand the role of physician leaders as health-care influencers and how they could better create trust and inform the Canadian public in the health information that is being conveyed. **Practical implications:** Physician leaders can play a key role in positively influencing institutional support for ethical and safe SM use and engagement practices. Physicians need to participate in developing regulations and guidelines that are fundamental to physician leaders' SM use. Central to this research would be the need to understand how physicians' cross-boundary practices have changed during and potentially post-COVID-19. Physician leaders also need to monitor information sources for credibility and ensure these sources are protected. As role models for the effective use of SM tools, physician leaders can mentor and coach colleagues and counterparts in this area. **Originality/value:** Although there have been studies of how physicians use SM, few explore why physician leaders cross boundaries (horizontal and stakeholder) using SM. Important insights are gained in physician leaders' practical use of SM. Key themes that emerged included organizational and individual, information, professional and regulations and guideline factors. These factors strengthen physician leaders' understanding of areas of foci to enhance their cross-boundary interactions. There is an urgency to study the complexity of SM and the effectiveness of regulations and guidelines for physicians, who are being required, at an accelerated rate, to strengthen and increase their cross-boundary practices.



Hancock, J., Witter, T., **Comber**, S., Daley, P., Candow, S., Follett, G., Sommer, W., White, J., Kits, O., (2021). Protocol paper – The impact of end-of-life care on burnout and moral distress in an academic ICU. *Critical Care Canadian Forum. Canadian Journal of Anesthesia*, 68, 1-90.

Introduction: Burnout from chronically high levels of stress in the workplace is characterized by emotional exhaustion, depersonalization and reduced personal accomplishment. Moral distress occurs when individuals are placed in situations that are at odds with their core values and have little power to make change. Both have a significant negative impact on healthcare providers and their families as well as patients. Causes are numerous, however provision of end-of-life care (EOLC) has been identified as a significant contributor. Objective: Within our ICU team, previous research quantified high rates of burnout and moral distress. The objective of this study was to describe the impact that EOLC has on burnout and moral distress for the team at an academic Intensive Care Unit in Halifax, Nova Scotia.

**Dana, L.-P.**, Tajpour, M., Salamzadeh, A., Hosseini, E., Zolfaghari, M. (2021). The impact of entrepreneurial education on technology-based enterprises development: The mediating role of motivation. *Administrative Sciences*, 11 (4), 105.

Technology-based enterprises play a paramount role in blooming a country economically. Nevertheless, according to a society's capacity to launch such enterprises in various eras, their volume is less than expected in many economies. Therefore, establishing such enterprises is necessary for developing any country, although its innovation system contributes to establishing them. This paper considers the impact of entrepreneurial education on technology-based enterprise development, including motivation as a mediator variable, in Esfahan Scientific and Industrial Town. Despite much research investigating the correlation between entrepreneurial education and technology-based enterprises' progress, it seems that no study has already considered this correlation with remarking the motivation as a mediator variable. This applied research follows a quantitative research design. The statistical population includes 500 enterprises in the Esfahan Scientific and Industrial Town, and for sampling, Cochran's formula was applied ( $n = 217$ ). Additionally, the researcher-made questionnaire and PLS3 software were used for data gathering and analysis. The results demonstrated that entrepreneurial education elements (including entrepreneurial skill, entrepreneurial learning, and entrepreneurial intention) positively affect technology-based enterprises' development, considering motivation as a mediator variable. However, the impact of entrepreneurial intention on technology-based enterprises was not supported. It reveals that the entrepreneurial intention of motivated individuals could have a meaningful effect on the development of technology-based enterprises. Therefore, motivation is a critical issue to be considered by managers and policymakers while considering entrepreneurial education-related policies and initiatives.

Truant, E., Broccardo, L., **Dana, L.-P.** (2021). Digitalisation boosts company performance: an overview of Italian listed companies. *Technological Forecasting and Social Change*, 173, 121173.

Digitalisation has become embedded in products and services, and it increasingly supports corporate business processes. However, few empirical studies have analysed the state of digitalisation and its implementation within companies, and the extant literature has painted an inconsistent picture concerning the effects of digitalisation. This survey-based study explores the diffusion of digitalisation, the advantages and difficulties in the practical transition to digitalisation, and its impact on performance. The sample includes Italian listed companies across diverse industries. The results highlight the still embryonic adoption of digital tools to support daily company operations; however, the impacts of digitalisation on company performance are noticeable. This research contributes to the

literature on digitalisation and performance, breaks new ground by focusing on listed companies, and has implications for management investment in digitalisation for value creation.

Yeza, H., Chabaud, D., **Dana, L.P.**, Maalaoui, A. (2021). The impact of bridging social capital in family firms' performance: exploring the mediation role of successor's social skills. *International Journal of Entrepreneurial Behaviour and Research*, 27 (8), 2009-2027.

Purpose: This paper investigates the impact of bridging social capital on the financial and non-financial performance of family businesses and explores the mediation role of social skills in the context of family succession. Design/methodology/approach: A quantitative study, through questionnaires, was conducted among 105 Tunisian family firms that have experienced a family succession for at least one year. The PLS-SEM analysis method was used to test the research hypothesis. Findings: Results show that an increase in external social capital is positively associated with financial performance and family-centred non-economic goals, whereas social skills mediate this positive relationship. Originality/value: The proposed model aims to test the direct effect of bridging social capital on family firms' performance and exploring the mediation role of the successor's social skills.

Amoozad Mahdiraji, H., Sedigh, M., Razavi Hajiagha, S.H., Garza-Reyes, J.A., Jafari-Sadeghi, V., **Dana, L.-P.** (2021). A novel time, cost, quality and risk tradeoff model with a knowledge-based hesitant fuzzy information: An R&D project application. *Technological Forecasting and Social Change*, 172, 121068.

This paper proposes a novel approach for identifying the best implementation situation for each activity in a project by optimizing and balancing time, cost, quality, and risk criteria under uncertain circumstances. A hesitant fuzzy linguistic term set (HFLTS) approach is proposed to determine the status of project activities in the presence of quality and risk criteria alongside time and cost. Afterwards, a multi-objective linear programming (MOLP) model is formulated for time, cost, quality, and risk trade-off (TCQRT). To validate the model, a research and development project in the food industry is investigated. The results indicate that the project's time compared to the deterministic approach was reduced by 20%. Completing the R&D project earlier than other competitors brings a higher profit for the company than trade-off expenses, even without considering the quality and risk trade-off benefits of the proposed approach. Considering uncertainty in the risk and quality of activities in a project via HFLTSs and optimizing all four elements of time, cost, quality, and risk simultaneously are the main values of this research. The proposed approach can be employed by managers to adopt and optimize project planning and scheduling while optimizing the trade-offs among TCQR factors in uncertain circumstances.

Chhabra, M., **Dana, L.-P.**, Malik, S., Chaudhary, N.S. (2021). Entrepreneurship education and training in Indian higher education institutions: a suggested framework. *Education and Training*, 63 (7-8), 1154-1174.

Purpose: The study aims to evaluate the components of entrepreneurship education and training (EET) in India. The paper proposes a framework for an effective EET regime for amalgamating entrepreneurship education as fundamental to mainstream higher education in India. Design/methodology/approach: The current study utilises a qualitative research technique, that is, the narrative inquiry methodology based on in-depth interviews. The study respondents included sixteen educators who are actively engaged in EET and related activities for a minimum of ten years. Findings: The study identified five broad "meaning units" or "themes," that is, "incremental pedagogical efficiency and flexible evaluation systems," "entrepreneurial experience of the faculty," "extended support," "holistic mentoring" and "experiential learning" as components of an effective EET regime. Originality/value: The study will help

policymakers and higher education institutions (HEIs) revisit their policy frameworks and practices to promote entrepreneurial capacity and entrepreneurial intentions among students. The study will also help to gain deeper insights into EET components and will propose a framework for an effective EET regime based on its findings.

Qureshi, M.I., Parveen, S., Abdullah, I., **Dana, L.-P.** (2021). Reconceptualizing the interventions of open innovation systems between the nexus of quadruple organization cultural dynamics and performance. *Quality and Quantity*, 55 (5), 1661-1681.

Although open innovation systems have drastically improved manufacturing performance, still many organizations are not able to leverage the open innovation systems due to cultural barriers. This research aimed to investigate the interventions of the open innovation systems between the relationships of organizational culture and organizational performance with the moderating effect of management support. A quantitative research design was employed to achieve research objectives. Data was collected through a structured questionnaire from 384 managers of the large manufacturing industry in Malaysia using a multistage random sampling technique. Structural equation modelling by using SMART PLS was used to test hypotheses. Results indicated that the relationship between organizational culture (e.g. clan, adhocracy, and market culture) and organizational performance was mediated by open innovation. Open innovation has no mediation effect between hierarchy culture and organizational performance relationship. While management support moderates the relationship between open innovation and organizational culture. The organizations exhibited more organic culture and focused on differentiation can harness open innovation and enhanced organizational performance.

Jafari-Sadeghi, V., Sukumar, A., Pagán-Castaño, E., **Dana, L.-P.** (2021). What drives women towards domestic vs international business venturing? An empirical analysis in emerging markets. *Journal of Business Research*, 134, 647-660.

Focusing on emerging markets, this paper compares the motives behind the entrepreneurial activities of women within and across national boundaries. The research builds on the opportunity-necessity spectra and explores the interaction of four types of entrepreneurial motives: (i) becoming independent; (ii) gaining financial rewards; (iii) the lack of employment alternatives; and (iv) multiple motives. Panel data from 25 emerging market countries for the seven-year period between 2010 and 2016 are tested through a static approach comparing fixed and random effects followed by dynamic analysis using the generalised method of moments estimator. The findings reveal that financial rewards (maintain/increase income) encourage women towards international entrepreneurship, whereas necessity-driven motives (lack of job alternatives) lead women to start businesses in their home countries. Additionally, nonfinancial desires (such as becoming independent) have a negative impact on both domestic and international entrepreneurship by women.

Ojong, N., Simba, A., **Dana, L.-P.** (2021). Female entrepreneurship in Africa: A review, trends, and future research directions. *Journal of Business Research*, 132, 233-248.

There has been a significant increase in scholarly literature about female entrepreneurship in Africa. In order to take stock of the state of female entrepreneurship on that continent, this paper examines articles published in peer-reviewed journals over the period 1987 to 2019. Using a mixed embeddedness approach, the analysis of these articles shows how cultural, institutional, economic, political, and social contexts shape the resources and strategies used by female entrepreneurs, and in turn, the interactions between the contexts, resources, and strategies determine the outcomes of female entrepreneurship in

Africa. We argue that the environments in which female entrepreneurs are embedded lead to the development of innovative strategies and ways of gaining access to diverse resources. More papers on female entrepreneurship in Africa were published between 2015 and 2019 than in the previous 27 years. A comprehensive analysis of the articles sampled for this systematic literature review has led to the development of new insights and opportunities for future research.

Fatma, E.B., Mohamed, E.B., **Dana, L.-P.**, Boudabbous, S. (2021). Does entrepreneurs' psychology affect their business venture success? Empirical findings from North Africa. *International Entrepreneurship and Management Journal*, 17 (2), 921-962.

This paper discusses the effect of psychological traits on success. We empirically explore the effect of entrepreneurs' psychological biases on their venture success. Using a sample of Tunisian entrepreneurs and the cognitive mapping technique, our results indicate that psychology does affect business venture success. Especially, the entrepreneurial overconfidence and optimism biases can largely affect the new venture success. However, other variables, such as capital and social networks, also have strong effects on new venture success in this country. We control for gender differences and their effects on our empirical findings. For this purpose, we divide our full sample to constitute two sub-samples using the entrepreneur's gender. We find that the behavioral factors, especially overconfidence, optimism and hope, have a great impact on new venture launched by female entrepreneurs compared to male entrepreneurs. In fact, the success of new venture launched by male entrepreneurs is less affected by behavioral factors and only the overconfidence bias can have an influence and their new venture success remains dependent to their age, experience and education

Vorobeva, E., **Dana, L.-P.** (2021) The COVID-19 pandemic and migrant entrepreneurship: Responses to the market shock. *Migration Letters*, 18 (4), 477-485.

The economic recession caused by the COVID-19 pandemic reinforced existing inequalities in the business market. Typically facing numerous structural constraints, during the ongoing crisis migrant entrepreneurs appear to be at greatly heightened risk. Applying Davidsson and Gordon's (2016) classification of crisis responses to the realm of migrant entrepreneurship, the current article intends to shed some light on what coping strategies are used by self-employed migrants when economic shocks arise. Four types of responses, namely, disengagement, delay, compensation, and adaptation, as well as their combination were identified in business practices of African entrepreneurs in Finland. The responses prove to be tightly linked to disrupted transnational business networks, limitations of technological solutions, and restricted access to funding and assistance.

Iftikhar, M., Qureshi, M.I., Qayyum, S., Fatima, I., Sriyanto, S., Indrianti, Y., Khan, A., **Dana, L.-P.** (2021). Impact of multifaceted workplace bullying on the relationships between technology usage, organisational climate and employee physical and emotional health. *International Journal of Environmental Research and Public Health*, 18 (6), 3207, 1-20.

This research article investigates the effect of organisational climate and technology usage on employees' physiological and emotional health damage resulting from face-to-face bullying and cyberbullying at the workplace. Furthermore, we investigated emotional intelligence as a coping strategy to moderate employee physiological and emotional health damage. The research used a quantitative research design. A five-point Likert-scale questionnaire was used to collect data from a multistage sample of 500 officials from Pakistan's four service sectors. Results revealed that organisational climate and technology usage are negatively related to face-to-face bullying and cyber-

bullying at the workplace. At the same time, workplace bullying adversely affects an employee's emotional and physiological health. However, emotional intelligence can reduce an employee's emotional health damage due to workplace bullying. Thus, we suggest incorporating emotional intelligence training at the workplace to minimise the devastating effects of face-to-face bullying and cyberbullying on employees' physical and emotional health.

Haq, M., Johanson, M., Davies, J., **Dana, L.-P.**, Budhathoki, T. (2021). Compassionate customer service in ethnic minority microbusinesses. *Journal of Business Research*, 126, 279-290.

Business researchers and policymakers frequently overlook ethnic minority microbusinesses. Yet, together with small and medium-sized organizations, microbusinesses drive both local and national economies. Combining social capital theory with the resource-based view and building upon 43 in-depth interviews, this study proposes a model of 'compassionate customer service'. In ethnic minority microbusinesses, coethnic culturally sensitive customer service is an important strategic resource for sustainable success, which high street chains lack. A key challenge for ongoing business survival and success is to ensure that future ethnic minority generations sustain coethnic compassionate customer service.

Dana, L.-P., Gurău, C., Hoy, F., Ramadani, V., Alexander, T. (2021) Success factors and challenges of grassroots innovations: Learning from failure. *Technological Forecasting and Social Change*, 164, 119600.

Grassroots innovation projects have the potential to generate novel, bottom-up solutions that respond to local situations, interests and values – solving the social, economic and environmental problems of marginalized communities; however, these projects can raise important challenges during their design, testing, development and implementation. Although extant studies identify some of these problems, the literature and practice lack a comprehensive diagnostic tool that can effectively predict the potential and success of grassroots initiatives. For this reason, important problems are often neglected, and failed projects are not thoroughly investigated and analyzed, which leads to missed opportunities of corrective learning. This study addresses this knowledge gap, proposing a diagnostic tool based on existing theoretical frameworks, which is then validated by investigating a failed grassroots innovation initiative, in order to identify its major shortcomings, and learn to avoid them in future projects. The findings also outline the role and importance of a socially inclusive approach for an effective deployment of grassroots initiatives, clarifying the relationship between grassroots innovation success and local community involvement.

Sahut, J.-M., **Dana, L.-P.**, Teulon, F. (2021). Corporate governance and financing of young technological firms: A review & introduction. *Technological Forecasting and Social Change*, 163, 120425.

It is timely for *Technological Forecasting and Social Change* to have a special issue bringing together recent research about corporate governance and financing of under-researched young technological firms. These enterprises tend to have much wealth stored in intangible assets that are seldom easy to measure. With their typical asset base unlike that of established corporations in traditional sectors, their growth is also different, often with a great need for resources, including capital infusions to capture entrepreneurial opportunities at various times. These new entrants in innovative and high-tech markets are characterized by an insatiable appetite for external financing, and the intrusion of new types of external funders has a strong impact on the governance of these ventures. It is therefore essential to have appropriate methods to finance growth; this has major implications for governance as well as finance. Although research underpinning the phenomenon of alternative finance has been gaining

ground, this is still a relatively under-researched field. This paper reviews relevant literature and presents an overview and brief synthesis of the contributions in this issue, within the context of literature and lacunae.

Song, Y., Dana, L.P., Berger, R. (2021). The entrepreneurial process and online social networks: forecasting survival rate. *Small Business Economics*, 56 (3), 1171-1190.

To launch a new business, entrepreneurs search for information and resources through their networks. We are concerned with collaboration among entrepreneurs with a network, and with the impact this has on new venture survival. Using entrepreneurs' network data extracted from their respective online social networks, our paper develops a simulation model of the entrepreneurial process and its outcomes in terms of growth and survival. Findings from 273 entrepreneurs reveal that initial wealth at start-up, network density, and time to first collaboration have an impact on the probability of survival. We show that using numerical simulation, and based on one's social network, the survival time of a start-up can be forecasted.

Dana, L.-P., Palalić, R., Ramadani, V. (Eds.). (2021). *Entrepreneurship in the Gulf Cooperation Council region: Evolution and future perspectives*. World Scientific Publishing Europe Ltd.

This book looks at the current state of entrepreneurship development in the Gulf Cooperation Council (GCC) region, consisting of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. It is a comprehensive state-of-the-art coverage of entrepreneurship and small business management issues, supported with theoretical discussion and empirical evidence. The book covers current processes in each country, paving the ways for potential investors, researchers, academics and professionals to better understand this region. An outcome of long-lasting endeavour, this book includes contributions from experts across the Gulf region.

Toska, A., Ramadani, V., Dana, L.-P., Rexhepi, G., Zeqiri, J. (2021). Family business successors' motivation and innovation capabilities: the case of Kosovo. *Journal of Family Business Management*.

Purpose: This study aims to investigate the second-generation successors' motives to join family businesses and their ability to generate innovation within them. Design/methodology/approach: A qualitative methodology is used in this study. Data were collected through structured interview with the second-generation representatives, where the data obtained helped us to come to the results and answer the research questions of the study. A total of 15 interviews were conducted. Findings: The findings of this study show that the second generation is motivated to continue the family business, cases show that successors since childhood have been oriented towards building an entrepreneurial mindset and also after entering the family business have generated innovation. Originality/value: The study will bring theoretical implications to the family business literature, providing scientific evidence for the second generation of family businesses, from an emerging country such as Kosovo. As Kosovo is an emerging country, the study will contribute to the literature, suggesting other studies by emerging countries in this way to see the similarities and differences.

Braune, E., Dana, L.-P. (2021). Digital entrepreneurship: Some features of new social interactions. *Canadian Journal of Administrative Sciences*.

Digital technologies permit a massive reduction of transaction costs. As a result, traditional social interactions that take place in the entrepreneurial ecosystem are disrupted and a new landscape

emerges. Digital platforms are the organizational form that benefit most from reductions in transaction costs; they take a prominent advantage from their ability to scout worldwide emergent knowledge, as well as their ability to match extraordinarily heterogeneous demands with dedicated supply. Digital platforms shape social interactions and the ways value is created in the global economy. As such, they are becoming the cornerstone of the digital entrepreneurship ecosystem. This special issue highlights some of the key features of the renewal of social interactions in the digital entrepreneurship ecosystem and opens up avenues for future research.

Ramadani, V., Emami, A., **Dana, L.P.** (2021). Editorial. *European Journal of International Management*, 16 (3), 359-363.

Chhabra, M., **Dana, L.**, Ramadani, V., Agarwal, M. (2021). A retrospective overview of *Journal of Enterprising Communities: People and Places in the Global Economy* from 2007 to 2021 using a bibliometric analysis. *Journal of Enterprising Communities*.

Purpose: This paper aims to examine the pattern of publications, using a bibliometric analysis of the *Journal of Enterprising Communities: People and Places in the Global Economy* (JEC) for the period 2007 to 2021. Design/methodology/approach: The study uses relevant bibliometric metrics and procedures. The analysis covers mainly the number of articles published in JEC, most influential years in terms of the number of publications and citations, top productive countries, most prolific authors, most influential institutions, funding institutions, co-authorship trends, keywords co-occurrence, and vital themes of JEC articles between 2007 and 2021. Findings: The journal's influential impact in terms of citations has increased over time, with 83.62% of the published works receiving at least one citation. Léo-Paul Dana has been recognised as the most prolific author by virtue of his contribution of articles in JEC, and the maximum contribution to JEC comes from the USA, followed by Canada and the UK. University of Canterbury, New Zealand and La Trobe University, Australia were the leading contributing institutions. The study identified "indigenous entrepreneurs", "gender", "social entrepreneurship", "education" and "innovation" as contemporary keywords in the study of enterprising communities. These issues present a clear opportunity for research-related topics for the JEC. Originality/value: To the best of the authors' knowledge, this is the first comprehensive piece in the journal's history that provides a general overview of the journal's major trends and researchers.

Ogundana, O.M., Simba, A., **Dana, L.-P.**, Liguori, E. (2021). Women entrepreneurship in developing economies: A gender-based growth model. *Journal of Small Business Management*, 59 (sup1), S42-S72.

Women entrepreneurship research in the developing world relies on theoretical perspectives derived elsewhere. Hence, understanding the original business-development approaches adopted by women entrepreneurs in developing economies remains elusive. Accordingly, we collected and analyzed rich data generated through 31 in-depth interviews and artifacts of Nigerian women entrepreneurs in the garment manufacturing business. Our analysis revealed distinct constructs that account for their business-development activities. It shows money (access and utilization), market (customer intelligence), and management (nonformal education and experience) as crucial enterprise development components in women entrepreneurship. Motherhood (household responsibilities), meso- and macro-environments (socioeconomic and cultural factors) not only affected business development but also inhibited women entrepreneurs' access and utilization of money, management, and markets and shaped their business development actions. Theoretical and practical implications for entrepreneurship research and policy development initiatives in the developing world are offered.

Pergelova, A., Angulo-Ruiz, F., **Dana, L.-P.** (2021). The entrepreneurial quest for emancipation: Trade-offs, practices, and outcomes in an indigenous context. *Journal of Business Ethics*.

This paper builds on theoretical developments that view entrepreneurship as emancipation, i.e., entrepreneurial activities as generators of change and pursuit of freedom from perceived constraints. Using a representative data set of 1,095 SMEs owned by Indigenous entrepreneurs in Canada, the authors investigate how pursuit of this freedom affects (i) the way entrepreneurs enact several aspects of their ventures and (ii) the performance outcomes achieved. Findings reveal how the initial motivations of entrepreneurs (seeking change for the social collective of which they are a part versus seeking autonomy for themselves) lead to distinct business practices, which in turn impact differentially entrepreneurial outcomes.

Anggadwita, G., **Dana, L.-P.**, Ramadani, V., Ramadan, R.Y. (2021). Empowering Islamic boarding schools by applying the humane entrepreneurship approach: the case of Indonesia. *International Journal of Entrepreneurial Behaviour and Research*, 27 (6), 1580-1604.

Purpose: Islamic boarding schools are educational institutions that have been developing in Indonesia as places for the Indonesian people to learn and gain knowledge in the perspectives of the Islamic religion and Indonesian nationalism. This study aims to explore the potential of Islamic boarding schools as places to support and empower the economy and to increase the participation of students in entrepreneurial activities by applying the Humane Entrepreneurship approach. This study identifies the humane entrepreneurship approach by analyzing the humane cycle and the enterprise cycle in the entrepreneurship activities occurring in a single case study of an Islamic boarding school.

Design/methodology/approach: This article used a qualitative method with a case study approach through deep exploration and observation. In-depth semi-structured interviews were conducted with the key people in one Islamic boarding school in Indonesia using a purposive sampling technique. Miles and Huberman's (1984) technique was used for data analysis by grouping similar text segments into codes and categorizing them for further analysis. Findings: The findings of this study indicate that the Islamic boarding school has implemented humane entrepreneurship through entrepreneurial-oriented activities as the main aspects of the humane cycle and the enterprise cycle. The implementation of humane entrepreneurship aims to achieve entrepreneurial growth, innovation and independence of the Islamic boarding school, as well as the development of the stakeholder's capabilities, knowledge and commitment. In addition, applying the spiritual approach, which is one of the important components of Islamic boarding schools, has proven to be effective in implementing humane entrepreneurship.

Research limitations/implications: This study has several limitations. First, it only focused on one Islamic boarding school in Indonesia. Second, there is still very little research in the field of humane entrepreneurship, so the concept itself is still considered to be relatively new. Therefore, further direction is needed for future research regarding the exploration and identification of any other factors that might influence humane entrepreneurship. Originality/value: This study provides new insights on the implementation of humane entrepreneurship in Islamic boarding schools. This research covers the gap where the humane entrepreneurial approach can be applied not only in large organizations, but also in religious educational institutions. The spiritual approach and religious values as the principles of Islamic boarding schools have been proven to be effective in implementing humane entrepreneurship.

Jafari-Sadeghi, V., Amoozad Mahdiraji, H., **Dana, L.-P.** (2021). Introduction: international entrepreneurship from methodological perspectives. *Contributions to Management Science*, 1-6.



This chapter provides an initial understanding of international entrepreneurship and its importance in the global economy. It is followed by an explanation of the structure of the book, highlighting two categories of qualitative and quantitative methods. Consequently, the chapter ends with a discussion about the outline of each chapter.

Kumar, S., Vanevenhoven, J., Liguori, E., **Dana, L.P.**, Pandey, N. (2021). Twenty-five years of the *Journal of Small Business and Enterprise Development*: a bibliometric review. *Journal of Small Business and Enterprise Development*, 28 (3), 429-455.

Purpose: Commensurate with the 25th anniversary of the *Journal of Small Business and Enterprise Development* (JSBED), this retrospective work distils trends across all original articles published in the journal during this time period. Design/methodology/approach: Bibliometric analysis techniques are used to analyse 917 original JSBED publications. Specifically, performance analysis is conducted to analyse the journal's publication and citation patterns, bibliographic coupling and author keyword co-occurrence analysis are conducted to identify major themes, and co-authorship analysis is conducted to analyse author collaborations. Findings: Results indicate JSBED has grown considerably since its inception, both in terms of publication and citations. JSBED's most prevalent themes include management and growth of small firms, entrepreneurship education, strategy in small firms, business development, technology in small firms, business competencies in small firms, internationalization in small firms, role of social capital, entrepreneurial orientation and entrepreneurship in under-represented and minority populations. Originality/value: This is the first comprehensive bibliometric analysis of JSBED in the journal's history. Accordingly, it presents a novel and heretofore disparate understanding of the key themes and dialogues emerging from an established journal with a growing reputation for scholarly and practitioner impact.

Etemad, H., Gurau, C., **Dana, L.-P.** (2021). International entrepreneurship research agendas evolving: A longitudinal study using the Delphi method. *Journal of International Entrepreneurship*.

The heterogeneity of research topics in international entrepreneurship (IE) makes the identification of a convergent research agenda difficult. Addressing this, we replicate a 2008 Delphi study, analyzing research directions considered relevant by recognized experts of IE, and also comparing the two sets of data, in an attempt to map the evolution of IE research. This is a first attempt to collect and analyze IE longitudinal data using the Delphi method. Findings provide a basis for developing a future research agenda, facilitating collaboration among researchers. This study can facilitate the understanding and enacting of IE activities for academics, entrepreneurs, and policy-makers.

Kalu, E.U., **Dana, L.** (2021). Socio-cultural web and environmentally-driven community entrepreneurship: a portrayal of Abia Ohafia community in South-Eastern Nigeria. *Journal of Enterprising Communities*.

Purpose: This study is aimed at providing a deduction on the necessity of social and cultural capital for entrepreneurial outcomes on a community-wide scale. Design/methodology/approach: There is a drift from an individualised form of entrepreneurship to community-based entrepreneurship with a grand focus on social needs of current and emergent nature. This study is both archival and exploratory and has pictured culture and communality as drivers that are needful for enterprising communities. Findings: This paper finds communality, social network, social capital and trust as push-factors for community-based entrepreneurship and development drives. Originality/value: This study is an original exposé on the Abia Ohafia community's Model of community-based entrepreneurship which thrives on strong institutions (like the Age Grade System) and age-long practices that have built trust and stability. This

local community through its networks, culture and communalities creates relationships, rational innovation, consensual leadership and participatory followership under which resources, opportunities and solutions are deliberately advanced for meeting social and community purposes.

[Dana, L.-P., Kumar, S., Pandey, N., Sureka, R. \(2021\). \*The Journal of Small Business Management: A bibliometric overview of 1996–2019. Journal of Small Business Management, 59 \(sup1\), S215-S236.\*](#)

*The Journal of Small Business Management* is a highly respected journal that publishes research about small business and entrepreneurship. Using bibliometric analysis, this study presents an overview of the major trends and themes in the journal's published content from 1996 to 2019. Over the years, the journal has grown significantly in terms of both publications and citations, with authors from the United States remaining the dominant contributors to the journal. The bibliographic coupling of the articles reveals that entrepreneurship, entrepreneurship education, family firms, board composition, and internationalization are among the major themes pursued by contributors.

[Tekin, E., Ramadani, V., Dana, L.-P. \(2021\). \*Entrepreneurship in Turkey and other Balkan countries: are there opportunities for mutual co-operation through internationalisation? Review of International Business and Strategy, 31 \(2\), 297-314.\*](#)

**Purpose:** The aim of this study is to evaluate entrepreneurship activity in Turkey and the Balkan countries and to show in which fields they can cooperate in the future. **Design/methodology/approach:** Document analysis was used in the research. In this context, taking into consideration the Global Entrepreneurship Index data published in 2019, the entrepreneurial potentials of Balkan countries, its current status was examined. Therefore, Turkey's contribution to the development of entrepreneurial activities in the Balkan countries is shown in the study. **Findings:** The results of the research show that entrepreneurship activities in the Balkan countries are not at the expected levels. In addition, it is determined that Turkey is in a central position in the Balkan's entrepreneurship ecosystem in subjects such as, especially, product innovation, risk capital, the ability of entrepreneurial start-up and its enterprises show high growth. Other Balkan countries may cooperate with Turkey about the production of technological products and technology transfer issues. Partner incubation programs can be formed. Training activities related to the entrepreneurship ecosystem can be organised together.

**Originality/value:** To the best of the authors' knowledge, this paper is one of the first studies that addresses the current situation of Balkan countries by analysing the entrepreneurship index scores of Turkey and Balkan countries (Albania, Bulgaria, Bosnia and Herzegovina, Montenegro, Romania, Croatia, Serbia, northern Macedonia, Greece and Slovenia). It also formulated suggestions on establishing cooperation with Turkey.

[Salamzadeh, A., Dana, L.P. \(2021\). \*The coronavirus \(COVID-19\) pandemic: challenges among Iranian startups. Journal of Small Business and Entrepreneurship, 33 \(5\), 489-512.\*](#)

The coronavirus outbreak has become a global issue with significant effects on capital markets and the global economy; its impacts are estimated to be even more than previous global recessions. In this interim, due to the impacts of this pandemic, startups are more prone to fail or succeed faster than ever before; however, the challenges they face are not yet clearly scrutinized, as the pandemic was faster than scholars. This study therefore investigates the main challenges of Iranian startups by interviewing the co-founders of fifteen well-known startups. The findings are analyzed through two-step coding, and findings were discussed in a focus group session to which startup co-founders, policymakers, and scholars were invited. It was revealed that there are six principal types of challenges to be addressed,

including financial, human resources management, support measures and mechanisms, marketing, crisis management, as well as some others.

Wang, Y., Rod, M., Deng, Q., Ji, S. (2021). Exploiting business networks in the age of social media: the use and integration of social media analytics in B2B marketing. *Journal of Business and Industrial Marketing*, 36 (12), 2139-2149.

**Purpose:** Based on an organizational capability perspective, this paper aims to propose a development model for social media analytics (SMA) capability that can be applied to business-to-business (B2B) marketing, with the aim of facilitating the use and integration of SMA in B2B marketing and maximizing the benefits of business networks in the age of social media. **Design/methodology/approach:** This is a critical interpretive synthesis of SMA publications collected from academic journals, business magazines and the SMA service industry. In addition, an inter-disciplinary approach was adopted by drawing upon both marketing and information systems literature. In total, 123 academic papers, 106 industry case studies and 141 magazine papers were identified and analyzed. The findings were synthesized and compiled to address the predefined research question. **Findings:** An SMA capability development model is proposed. The proposed model consists of four inter-dependent levels (technological, operational, managed and strategic) that collectively transfer the technological capability of SMA to the dynamic organizational capability. Each level of SMA capability is detailed. SMA-in-B2B marketing is highlighted as a socio-technical phenomenon, in which a technological level SMA capability is emphasized as the foundation for developing organizational level SMA capabilities and organizational capabilities, in turn, supporting and managing SMA activities and practices (e.g. strategic planning, social and cultural changes, skills and resources, measurements and values). **Practical implications:** The proposed research framework may have implications for the operational level SMA development and the investigations on the direct and/or indirect measurements to help firms see the impact of SMA on their business. **Originality/value:** This study may have implications for the adoption, use, integration and management of SMA in B2B marketing. The proposed model is grounded on the integrated insights from academia and industry. It is particularly relevant to B2B firms that have engaged in or plan to engage in applying SMA to extract insights from their online networks and is relevant to B2B researchers who are interested in SMA, big data and information technology organization integration studies.

Deng, Q., Wang, Y., Rod, M., Ji, S. (2021). Speak to head and heart: The effects of linguistic features on B2B brand engagement on social media. *Industrial Marketing Management*, 99, 1-15.

Brand engagement on social media increasingly draws B2B brands' attention as it may produce positive WOM and bring branding and financial benefits. However, B2B marketers face challenges in creating compelling brand posts on social media. Beyond 'knowing what to post', what is even more challenging for B2B marketers is a lack of knowledge of 'knowing how to communicate', i.e., knowing how to design the non-informational cues in brand posts to stimulate brand engagement and generate social media WOM. This research makes initial attempts to address this gap by investigating the impacts of post language on B2B brand engagement on social media. Building on the model of B2B effective communication and theories in linguistics, we identify six linguistic features (i.e., post length, language complexity, visual complexity, emotional cues, interpersonal cues, and multimodal cues in rich media) that influence brand engagement, captured using Twitter likes and retweets. Through analyzing 229,272 tweets collected from 156 B2B brands in 10 industries, we found that, in general, linguistic features that facilitate the central or peripheral route processing will have positive effects, while those that hinder the processing will have negative impacts on brand engagement. This research contributes to our knowledge of B2B social media communication by revealing the power of brand language in driving

brand engagement and introducing linguistics as a valuable conceptual lens for maximizing the benefits of B2B marketing content on social media. This research also highlights the interpretative nature of social media communication – B2B brands must go beyond the content purpose and strategy decisions to consider the specific language use and communication style of the message.

[Deng, Q., Hine, M.J., Ji, S., Wang, Y. \(2021\). Understanding consumer engagement with brand posts on social media: The effects of post linguistic styles. \*Electronic Commerce Research and Applications\*, 48, 101068.](#)

Creating brand posts that stimulate consumer engagement on social media is both vital and challenging to digital marketers. Despite previous research on this topic, to date, little is known about how the linguistic styles of brand posts influence consumer engagement. Based on the communication accommodation theory, brand anthropomorphism literature, and linguistic research, this paper examined the effects of three brand post linguistic styles, namely, emotionality, complexity, and informality, on consumer engagement. Through analyzing the 15,396 brand posts collected from 104 Facebook pages, we found that the linguistic styles of brand posts can impact consumer engagement, but the effects vary regarding the three consumer engagement behaviors (i.e., like, share, comment). The findings of this paper improve our understanding of the role that language plays in brand-consumer communications on social media as well as provide guidelines for social media marketers on how to design engaging brand posts from the perspective of linguistics.

[McShane, L., Pancer, E., Poole, M., Deng, Q. \(2021\). Emoji, playfulness, and brand engagement on Twitter. \*Journal of Interactive Marketing\*, 53, 96-110.](#)

Brands, both human and corporate, are increasingly communicating with their consumers using emojis. The current work examines if and how these pictographs shape online brand engagement on Twitter (i.e., likes & retweets). To do so, we first examine datasets generated by scraping the tweets of the most popular celebrity brands and most popular corporate brands (Study 1). This study demonstrates that emoji presence increases engagement with tweets, with more emoji leading to more likes and retweets. Two controlled experiments then explore the role of perceived playfulness in explaining this effect of emojis on engagement (Studies 2 and 3). We find that the effect of emojis on brand engagement varies depending on the nature of the interplay between emojis and text, and the subsequent effect of this interplay on perceived playfulness. Theoretical contributions and social media practitioner implications are also addressed.

[Deng, Q., Hine, M.J., Ji, S., Wang, Y. \(2021\). What makes brand social media posts engaging? An integrative framework and future research agenda. \*Journal of Internet Commerce\*.](#)

Creating engaging brand posts is both vital and challenging for social media marketers. While previous research suggests that digital marketers can strategically design brand posts to enhance consumer engagement, it is unclear what post contents work better, for which brand, and in what way. Through the in-depth review of 82 empirical papers on consumer engagement with brand social media posts, this paper shows that previous research has adopted a highly consistent and convergent research design but produced many inconsistent, sometimes even contradictory results. An integrative framework of consumer engagement of brand posts on social media is developed, and four future research agendas are identified and discussed. This paper provides a landscape description on consumer engagement with brand posts on social media research and a roadmap of potential research agendas that can be further

explored. This paper also provides digital marketing practitioners useful insights in designing brand posts on social media.

Wang, Y., Deng, Q., Rod, M., Ji, S. (2021). A thematic exploration of social media analytics in marketing research and an agenda for future inquiry. *Journal of Strategic Marketing*, 29 (6), 471-491.

This paper aims to present the current social media analytics in marketing research. A bottom-up thematic content analysis of 123 academic papers from 38 top Marketing and Information Systems journals was conducted. Types of social media platform, data, and analytics; marketing themes; and fields of study that are involved in social media analytics research are identified. The match between technological inputs and marketing outputs is presented. The findings reveal the current status of social media analytics in marketing research and identify various untapped areas for further research. This paper proposes that the impact of social media analytics is not restricted as a marketing research method; it fosters or amplifies changes in marketing approach, and structure and culture in organisations. To maximise its benefits, this paper suggests that firms could strategically build a technological knowledge base of social media analytics, and strategically manage and support its use by facilitating IT-marketing and IT-organisation alignments.

Pfeiffer, B.E., Sundar, A., Deval, H. (2021). Not too ugly to be tasty: Guiding consumer food inferences for the greater good. *Food Quality and Preference*, 92, 104218.

The issue of food waste is an important societal challenge with a significant environmental impact. An important issue contributing to food waste is consumers' unwillingness to purchase suboptimal food. Past literature has shown that people prefer perfectly formed food to abnormally shaped food when given a choice, but much of the mechanism underlying this preference is not well documented. Using a framework based on the halo effect, the authors focus on consumers' affective and cognitive responses that cause them to shy away from produce that does not meet the usual aesthetic criteria. Results demonstrate that consumers find well-formed produce vs. deformed produce to be more aesthetically pleasing (beautiful) and that this positive affective reaction leads to more positive consumer inferences of taste, health, and quality. Results also indicate that consumers view sellers of well-formed produce to be more competent than sellers of deformed produce and that this perception is driven by perceptions of beauty and consumer inferences of taste, health, and quality. Lastly, results show that the effects of form on consumer inferences may depend on different distribution channels. Shopping at a farmers market mitigates the impact of the deformation on consumer inferences. Given that form and actual taste, health, and quality are not generally correlated, the results indicate that consumers are making inaccurate inferences. Exploring these inferences has the potential to open new avenues to educate consumers.

El Hazzouri, M., Carvalho, S.W., Main, K. (2021). Dissociative threat: underperforming to distance the self from undesirable groups. *European Journal of Marketing*, 55 (3), 814-839.

Purpose: This study aims to introduce the concept of dissociative threat, which is the fear of being associated with an undesirable (dissociative) group as a result of demonstrating ability in a domain that is stereotypically linked to that group. Consumers experiencing dissociative threats use inability signaling as a self-presentational strategy in which they present themselves as lacking ability in the dissociative domain. Design/methodology/approach: Five experimental studies were conducted to test whether consumers experience threat in dissociative domains and to examine factors that influence this threat. Findings: Results showed that dissociative threat adversely affects consumers' performance at tasks that

require using products linked to dissociative groups. Threatened participants reported intentions to perform poorly and train for a longer time in preparation for such tasks, thus signaling low ability in dissociative domains. Additionally, when participants who were experiencing dissociative threats received confirmation that they lacked ability in that domain, their performance at these tasks improved. Research limitations/implications: This study expands the knowledge on strategies, including inability signaling, that consumers use to avoid being linked to dissociative groups. Practical implications: The findings suggest to marketers that stereotypes that link their products to certain consumer segments can threaten other consumers. Factors that shape and alleviate this threat are identified, which may help companies that are marketing such products. Originality/value: This study extends the current understanding of stereotype threat and proposes a new self-presentational strategy, that has not been documented yet in the literature (i.e. inability signaling), that consumers use to deal with the dissociative threat.

**Fooladi, I.J., Jacoby, G., Jin, L. (2021).** Real duration and inflation duration: A cross country perspective on a multidimensional hedging strategy. *Journal of International Financial Markets, Institutions and Money*, 70, 101265.

In this study we consider two different duration measures: (i) real duration, which is a measure of a financial instrument (asset or liability) value sensitivity with respect to changes in the real interest rate, and (ii) expected-inflation duration, which is a measure of the instrument value elasticity with respect to changes in the expected rate of general price inflation. These two measures arise because the nominal interest rate is divisible into a real rate and the expected-inflation rate. Thus, when inflation is present, a duration measure depends on the source of the change in the interest rate. We empirically examine cross-country differences and show that in low (negative) nominal rate environments (France and Germany), nominal rates are less responsive to changes in inflation expectations than in a high nominal rate environment (Italy). We show that under-protection of cash flows against inflation may significantly lower the asset value with a sizeable expected-inflation duration. On the other hand, assets with an indexation scheme that over protects against inflation, will be significantly more expensive with nontrivial and negative elasticity with respect to the inflation rate. Finally, we demonstrate that the real and expected-inflation duration can be utilized to simultaneously hedge the net worth of a firm against adverse impacts of changes in the real interest rate and changes in the expected-inflation rate.

**Pastor, C.B.N., Cayllahua, B.J.C., Armas-Aguirre, J., Gonzalez, P.A. (2021).** A frugal wireless cardiovascular monitoring system for senior dogs. *2021 7th Congreso Internacional de Innovacion y Tendencias en Ingenieria, CONIITI 2021 - Conference Proceedings*.

In this paper, a low-cost digital solution is proposed to monitor cardiovascular anomalies in dogs of advanced age. Heart anomalies are one of the most common health concerns in dogs of advanced age. Difficulty in breathing, exercise intolerance and unexplained vomiting are signs of possible heart problems in dogs. When these symptoms are present, dogs should constantly be monitored by a veterinarian. However, the monitoring and control of these illnesses are often expensive, and coverage is limited in some regions. The proposed system uses a smart collar with sensors such as accelerometer and gyroscope to obtain physiological variables of the pet directly and indirectly in real time. In a traditional scenario, the veterinarian uses specialized instruments to measure physiological variables onsite, but the prototype allows remote monitoring. The proposed system integrates 4 phases: 1) Data collection through wearable sensors, 2) Data reception in the mobile application, 3) Processing and storage of physiological variables and 4) Generation of reports and alerts in the mobile application. Preliminary results indicate that the prototype could be a promising digital solution to improve the

monitoring and control of these anomalies among dogs. Finally, a discussion of the challenges of development and implementing these solutions is presented.

la Torre, C.G.A., la Torre, D.A.A., Armas-Aguirre, J., **Gonzalez, P.A.** (2021). Assistive technology to monitor and reduce anxiety levels among college students throughout the analysis of heartbeat frequency. *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology, 2021-July.*

We developed a smart wearable system to identify, monitor and reduce levels of anxiety of college students by using a wearable device and a mobile application. Anxiety is one of the most frequent mental health problems of college students. Prior studies suggest that anxiety is related to low study performance, college attrition, heart-related condition, and depression. Despite the availability of college resources offered to assist students (e.g., counselling services), only 1 in 5 students with anxiety issues receives an adequate treatment. Two highlighted reasons for this gap are stigma and preference for self-mutual help. The proposed wearable system includes a wearable device and a mobile application with embedded recommended activities to reduce anxiety levels of college students. The solution has 5 components: 1) Gathering of physiological variables through the wearable, 2) Integrating the wearable and the mobile application, 3) Storing data, 4) Integrating the solution and web application and 5) Monitoring, treatment and identification of anxiety levels. The system was validated at a University in Lima, Peru with 10 students between 18 and 23 years old. The preliminary results indicated that the system could identify and help in reducing effectively the level of anxiety in 80% of the cases students.

Bocángel, J.M.S., Yañez, D.D.O., Armas-Aguirre, J., **Gonzalez, P.A.** (2021). Comprehensive monitoring police system to manage the complaint process on gender violence in Peru. *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology, 2021-July.*

In this article, a technological police system is proposed that allows optimizing the complaint process in cases of Violence Against Women in Peru. Gender violence is a cause of death and disability among women between the ages of 18 and 44, affecting all social and cultural groups in the world. In Peru, 222,234 complaints of family violence were registered, of which 65,000 cases correspond to the Women's Emergency Center requesting judicial, psychological and social help. Based on the study carried out, it was identified that the National Police of Peru receives complaints about gender-based violence, but it takes time to provide comprehensive follow-up since some of the tasks in the process are carried out manually. For this reason, the project proposes a technological solution to reduce the time for registering complaints about violence against women. The solution presented consists of four components: 1) A mobile application, focused on female citizens who are victims of gender violence, 2) A web application, aimed at those responsible for the process, 3) Back-end, and 4) Integration with devices of early warning. The proposal was functionally validated by a sample of 15 women between the ages of 19 and 43 who were victims or witnesses of violence against women, an officer from the National Police of Peru and a worker from the Women's Emergency Center. Likewise, 20 simulations of complaint registers were carried out using the proposed solution. The preliminary results obtained during the validation phase showed that the average time used to register the complaints was reduced by 95.9%.

la Chira, A.I.F., Torres, R.E.M., Armas-Aguirre, J., **Gonzalez, P.A.** (2021). Wireless uterine contractions monitoring system for pregnant women using a low-cost integrated sensor network. *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology, 2021-July.*

In this article, we propose a wireless uterine contraction monitoring digital solution for pregnant women in the third trimester of pregnancy using low-cost electromyography sensors. The solution is intended to detect abnormalities, reduce premature birth issues and provide a safe and controlled system, especially for first-time pregnant women. The pandemic and remote location have significantly decreased prenatal care. In Peru, for instance, a large population of pregnant women resides in villages and locations where obstetric care is not offered. Transportation and lodging costs as well as the fear of contracting a virus have increased health and pregnancy complications. With the proposed solution, we aim to mitigate these issues by proposing a safe, simple, wireless, low-cost and reliable monitoring solution. The solution includes four components: 1. An electromyography sensor that records contractions and sends them to the smartphone via Bluetooth; 2. A mobile application that sends the data to the cloud; 3. The registration of information in the database; 4. Alert and notification system. Preliminary results show that the solution was able to meet the crucial obstetric care offerings and the waiting time to have a first contact with an obstetrician.

**Gonzalez, P.A.,** Ashworth, L. (2021). Not your typical leader? How perceptions of CIOs compare to other members of the top management team. *Communications of the Association for Information Systems*, 49, 515-534.

In this paper, we examine chief information officers' (CIO) perceptual profiles relative to other top management team (TMT) members. CIOs' profile reveals that decision makers perceive them as less authoritative and less socially adept, important traits for strategic leadership. Decision makers also perceive them to have less in common with successful business leaders than either chief finance officers (CFOs) or chief marketing officers (CMOs). These findings highlight important differences in the way that decision makers perceive CIOs relative to their top management team colleagues and shed light on a possible reason for some challenges that CIOs frequently face in organizations.

Nuñoovero, D., Rodríguez, E., Armas, J., **Gonzalez, P.** (2021). A Technological Solution to Identify the Level of Risk to Be Diagnosed with Type 2 Diabetes Mellitus Using Wearables. *Smart Innovation, Systems and Technologies*, 202, 169-175.

This paper proposes a technological solution using a predictive analysis model to identify and reduce the level of risk for type 2 diabetes mellitus (T2DM) through a wearable device. Our proposal is based on previous models that use the auto-classification algorithm together with the addition of new risk factors, which provide a greater contribution to the results of the presumptive diagnosis of the user who wants to check his level of risk. The purpose is the primary prevention of type 2 diabetes mellitus by a non-invasive method composed of the phases: (1) Capture and storage of risk factors; (2) Predictive analysis model; (3) Presumptive results and recommendations; and (4) Preventive treatment. The main contribution is in the development of the proposed application.

Prada, E.J.M., Agullar, H.M.A.H., Armas-Aguirre, J., **Gonzalez, P.A.** (2021). Wearable technology for presumptive diagnosis of high blood pressure based on risk factors. *Smart Innovation, Systems and Technologies*, 202, 25-34.

In this paper, we propose a technological solution integrated to a wearable device that allows measuring some physiological variables such as body mass index (BMI), steps walked in a determined day, burned calories, blood pressure and other risk factors associated with the Framingham's score. The objective of this article is to identify the evolutionary pattern of the Framingham's score each day in order to



determine a presumptive diagnosis of high blood pressure. The technological solution was validated in the social insurance of a public hospital in Lima, Perú. The preliminary results obtained in a diagnostic test show a sensitivity level of 83.33%, a level of precision better than a traditional Framingham's score for presumptive diagnosis of high blood pressure. Our proposal contributes to the patient's awareness about the bad routine habits related to lifestyle and promotes the empowerment of data in order to make some changes that influence on the reduction of cardiovascular disease risk.

**Hebb, G.** (2021). *On the performance of bank-managed mutual funds: Canadian evidence.* *Journal of Economics and Finance*, 45 (1), 22-48.

Commercial bank involvement in the mutual fund industry has been growing globally for the last few decades. General perception of the performance of these bank-managed funds has been negative. Academic studies of the issue have had varying results. This paper examines the issue in Canada where bank and independent funds have similar overall market shares and thus market power is not an issue. Our results show that after properly accounting for double-clustering, risk-adjusted returns are not significantly different between the two groups. Systematic risk, however, is different for equity funds but not for bond or balanced funds. These findings will be useful for both regulators and individual investors.

**James, A., Hadjielias, E., Guerrero, M., Discua Cruz, A., Basco, R.** (2021). *Entrepreneurial families in business across generations, contexts and cultures.* *Journal of Family Business Management*, 11 (4), 355-367.

**Purpose:** This article is the editorial for the special issue on "Entrepreneurial Families in Business Across Generations, Contexts and Cultures". We aim to develop a road map that can help academics and practitioners navigate the findings of the articles contained in this special issue. We also suggest future lines of research around the topic of entrepreneurial families in business.

**Design/methodology/approach:** We develop a conceptual model for interpreting and understanding entrepreneurial families in business across contexts and time. **Findings:** Our conceptual model highlights the importance of context and time when conducting research on entrepreneurial families in business.

**Practical implications:** The findings in this special issue will be of relevance for decision makers who tailor policies that embrace different economic and social actors, including entrepreneurial families.

**Originality/value:** This editorial and the articles that make up this special issue contribute to family business research by contextualising the phenomenon of entrepreneurial families in business. We propose a new holistic perspective to incorporate context and time in the study of entrepreneurial families that own, govern and manage family firms over time.

**Walsh, B.M., Kabat-Farr, D., Matthews, R.A., Schulte, B.D.** (2021). *Willingness to recommend: Does workplace incivility actually play a role?* *Journal of Business and Psychology*, 36 (5), 841-856.

To prevent workplace incivility, scholars encourage organizations to use reference checks to help eliminate uncivil applicants. However, under certain conditions, reference providers may be willing to recommend their rude colleagues for employment. We test this possibility by studying willingness to recommend, which captures a willingness to serve as a professional reference for a colleague. Based on signaling theory, we hypothesized that colleague incivility is negatively related to willingness to recommend, but this relationship is moderated by colleague in-role performance and job-level factors. In study 1, multilevel modeling of multisource data revealed that colleague incivility negatively related to willingness to recommend, but troublingly, this relationship was weaker among colleagues who were

high rather than low performers, regardless of job-level moderators. In study 2, we tested whether organizations can intervene and encourage potential reference providers to pay greater attention to incivility. Regression results showed that providers placed greater weight on their colleague's incivility in relation to willingness to recommend when signals were sent that the hiring organization was unwilling to sacrifice civility for top performance. Our research helps illuminate when incivility instigators are likely to be recommended for employment and demonstrates a way to maximize the use of reference checks for incivility prevention.

**Kabat-Farr, D., Labelle-Deraspe, R. (2021, August 19). Five ways to reduce rudeness in the remote workplace. *Harvard Business Review*, digital article. <https://hbr.org/2021/08/5-ways-to-reduce-rudeness-in-the-remote-workplace>**

As organizations adopt virtual operations as a core way of conducting business in the long term, managers need to be conscious of the powerful effect of slights, snubs, and other rude behavior on employee and team functioning. For employees from marginalized groups, patterns of uncivil experiences may signal that they don't belong in the organization or that their perspective is not welcome. Managers can create an antidote to incivility by providing opportunities for personal connections and accountability to shared norms of respect. The authors present five of their best pieces of advice for conducting virtual work that will cultivate positive relationships among your team.

**Hahn, T.-A., King, T. (2021). When I grow up ... understanding the motivations that individuals have for pursuing a career in tax. *Issues in Accounting Education*, 36 (3), 1-21.**

Often seen as a specialization, the motivation to pursue a career in tax is not well understood, compared to the broader disciplines of law and accounting. Relying on an initial set of exploratory interviews, this study examines why individuals have decided to pursue careers as tax practitioners. A survey more systematically investigated the motivations, revealing that the qualitative nature of tax work, including the intellectual challenge, is the strongest motivator, regardless of professional background. Overall, intrinsic motivations dominate over more external reasons, and the survey results are largely consistent and convergent with the interview findings. The study contributes to the understanding of the factors that influence individuals to both enter and remain in a very specialized field, which has hereto received limited direct attention. The results should be of interest to students considering a career in tax, as well as those in charge of educating and recruiting future tax practitioners.

**Lee, K.Y., Sheehan, L., Lee, K., Chang, Y. (2021) The continuation and recommendation intention of artificial intelligence-based voice assistant systems (AIVAS): the influence of personal traits. *Internet Research*, 31 (5), 1899-1939.**

**Purpose:** Based on the post-acceptance model of information system continuance (PAMISC), this study investigates the influence of the early-stage users' personal traits (specifically personal innovativeness and technology anxiety) and ex-post instrumentality perceptions (specifically price value, hedonic motivation, compatibility and perceived security) on social diffusion of smart technologies measured by the intention to recommend artificial intelligence-based voice assistant systems (AIVAS) to others. **Design/methodology/approach:** Survey data from 400 US AIVAS users were collected and analyzed with Statistical Product and Service Solutions (SPSS) 18.0 and the partial least square technique using advanced analysis of composites (ADANCO) 2.1. **Findings:** AIVAS technology is presently at the early stage of market penetration (about 25% of market penetration in the USA). A survey of AIVAS technology users reveals that personal innovativeness is directly and indirectly (through confirmation

and continuance) associated with a stronger intention to recommend the use of the device to others. Confirmation is associated with all four ex-post instrumentality perceptions (hedonic motivation, compatibility, price value and perceived security). Among the four, however, only hedonic motivation and compatibility are significant predictors of satisfaction, which lead to use continuance and, eventually, intention to recommend. Finally, technology anxiety is found to be indirectly (but not directly) associated with a lower intention to recommend. Originality/value: This is the first study conducted on the early-stage AIVAS users that evaluates the influence of both personal traits and ex-post instrumentality perceptions on users' intention for continuance and recommendation to others.

Li, L., Lee, K.Y., Emokpae, E., Yang, S.-B. (2021). What makes you continuously use chatbot services? Evidence from Chinese online travel agencies. *Electronic Markets*, 31 (3), 575-599.

Thanks to artificial intelligence, chatbots have been applied to many consumer-facing applications, especially to online travel agencies (OTAs). This study aims to identify five quality dimensions of chatbot services and investigate their effect on user confirmation, which in turn leads to use continuance. In addition, the moderating role of technology anxiety in the relationships between chatbot quality dimensions and post-use confirmation is examined. Survey data were gathered from 295 users of Chinese OTAs. Partial least squares (PLS) was used to analyze measurement and structural models. Understandability, reliability, assurance, and interactivity are positively associated with post-use confirmation and technology anxiety moderates the relationships between four chatbot quality dimensions and confirmation. Confirmation is positively associated with satisfaction, which in turn influences use continuance intention. This study examines how chatbot services in OTAs are considered by users (human-like agents vs. technology-enabled services) by investigating the moderating role of technology anxiety.

Kwon, W., Lee, M., Back, K.-J., Lee, K.Y. (2021). Assessing restaurant review helpfulness through big data: dual-process and social influence theory. *Journal of Hospitality and Tourism Technology*, 12 (2), 177-195.

Purpose: This study aims to uncover how heuristic information cues (HIC) and systematic information cues (SIC) of online reviews influence review helpfulness and examine a moderating role of social influence in the process of assessing review helpfulness. In particular, this study conceptualizes a theoretical framework based on dual-process and social influence theory (SIT) and empirically tests the proposed hypotheses by analyzing a broad set of actual customer review data.

Design/methodology/approach: For 4,177,377 online reviews posted on Yelp.com from 2004 to 2018, this study used data mining and text analysis to extract independent variables. Zero-inflated negative binomial regression analysis was conducted to test the hypothesized model. Findings: The present study demonstrates that both HIC and SIC have a significant relationship with review helpfulness. Normative social influence cue (NSIC) strengthened the relationship between HIC and review helpfulness. However, the moderating effect of NSIC was not valid in the relationship between SIC and review helpfulness. Originality/value: This study contributes to the extant research on review helpfulness by providing a conceptual framework underpinned by dual-process theory and SIT. The study not only identifies determinants of review helpfulness but also reveals how social influences can impact individuals' judgment on review helpfulness. By offering a state-of-the-art analysis with a vast amount of online reviews, this study contributes to the methodological improvement of further empirical research.

**Macdonald, L.** (2021). The cookie report: Findings, conclusions, and recommendations. In J. Whalen (Ed.), Selections from the ABC 2020 annual conference, online: Business dress and pajama bottoms-- My favorite assignment goes online. *Business and Professional Communication Quarterly*, 84 (2), 156-176.

Nazaire, G., **Pacurar, M., Sy, O.** (2021). Factor investing and risk management: Is smart-beta diversification smart? *Finance Research Letters*, 41, 101854.

In this paper, we investigate the diversification benefits associated with factor investing in U.S. stock markets, using the dummy-variable framework for asset allocation. We find that beta-based investment strategies are primarily driven by beta-specific sources of return variation. At the same time, both betas and characteristics explain the variance of characteristic-based strategies, indicating that beta diversification is a more effective risk management tool than characteristic diversification. We also find that the correlations between the pure premiums of the 14 factor-based strategies considered are small, which suggests that diversification across smart-beta funds is beneficial. Monte Carlo simulations confirm these results.

Begin, G., Al-Tamimi, K.M., Alamdari, H.H., **Roach, D.C.**, Schmidt, M., El-Sankary, K. (2021). Respiratory bidirectional ultrasonic TOF flow sensor resilience to ambient temperature fluctuations. *IEEE Sensors Journal*, 21 (17), 18920-18931.

Measuring fluid flow velocity using ultrasonic based sensors has been established for some time, however implementation of this technology in respiratory systems is relatively recent. This paper presents the design of a respiratory flow sensor made possible by the air-coupling ultrasound principle. A prototype has been developed as a proof-of-concept. To enhance the signal to noise ratio (SNR), the modulated ultrasound arrival time is translated to a digital word using Time-to-Digital Conversion (TDC). Hence, the respiration is digitally captured in real time to offer a synchronous respiratory monitoring. The near-zero deviation is further alleviated by least mean square (LMS) technique accomplished off-line. Down to 0.03 L/s of resolution and over 95% of linearity is achieved. The bidirectional transmit/receive echo signals have been leveraged to provide a system-level cancelation of the environmental conditions affecting measurement accuracy. The developed sensor was used on adult volunteers and tested experimentally using an ASL5000 lung simulator. The results validate the system functionality in the presence of real-world conditions.

Hanafi Alamdari, H., Hacquebard, L., Driscoll, S., El-Sankary, K., **Roach, D.**, Leblanc, R., Lowe, S., Oore, S., Penzel, T., Fietze, I., Schmidt, M., Morrison, D. (2021). High frequency–low amplitude oscillometry: Continuous unobtrusive monitoring of respiratory function on PAP machines. *IEEE Transactions on Biomedical Engineering*.

Oscillometry or Forced Oscillation Technique, traditionally used in intermittent clinical measurements, has recently gained substantial attention from its application as a continuous monitoring tool for large and small airways. However, low frequency (< 8 Hz) continuous oscillometry faces high breathing noise, and hence requires high oscillation amplitudes to maintain an acceptable signal-to-noise ratio. Therefore, PAP machines that utilize low frequency oscillometry do so intermittently to distinguish airway patency several seconds after a breathing pause has occurred. We hypothesized that high frequency and low amplitude (HFLA) oscillometry may be as sensitive and applicable for monitoring upper airway patency to distinguish between central and obstructive apnea and hypopnea events, and for monitoring respiratory impedance. An inline oscillometry prototype device was developed and connected to commercial PAP machines to test whether oscillometry at 17, 43, and 79 Hz are as

sensitive to airway patency as oscillometry at 4 Hz. Analysis of 11 patients with 171 apneas and hypopneas showed that all frequency oscillometry inputs were equally sensitive in distinguishing between central and obstructive apneas, while 17 Hz and 43 Hz oscillometry were most sensitive in distinguishing between central and obstructive hypopneas. Observations during normal breathing also showed the same periodicity and cross-correlation between impedance measurements from HFLA oscillometry compared to 4 Hz. Our findings provide an unobtrusive means of distinguishing airway patency during sleep and a means of continuous monitoring of respiratory function, with the potential for detection and prediction of developing respiratory diseases and significantly richer context for data analytics.

[Ohreen, D., Sundararajan, B., Trifts, V., Comber, S. \(2021\). Vygotskian business ethics: The influence of peers on moral reasoning in business ethics education. \*Journal of Management Education\*, 46, 70-105.](#)

The Russian developmental psychologist Lev Vygotsky provides important theoretical underpinnings for an alternative to business ethics pedagogy. Although Vygotsky's constructivist approach has been applied to other disciplines, such as cognitive development, moral development, and network analysis and learning, its application to business ethics education is virtually nonexistent. Vygotsky's focus on language and peer influence provides a novel approach to ethics education. Although many business ethics instructors already use group discussion in their classes, we provide evidence that will reinforce such techniques as a crucial pedagogical method. This study is an exploratory application of Vygotsky's developmental theory to business ethics education. Data were gathered in business ethics and management courses, with experimental and control groups, and analyzed using the Defining Issues Test and thematic-coded journal entries. Results indicated that discussions created a zone of proximal development improving the moral reasoning for most students giving them multiple perspectives and providing support to engage in deliberations and peer dialogue when discussing ethical frameworks, ethical scenarios, and ethical decision making.

[Nabipour, M., Ülkü, M.A. \(2021\). On deploying blockchain technologies in supply chain strategies and the covid-19 pandemic: A systematic literature review and research outlook. \*Sustainability \(Switzerland\)\*, 13 \(19\), 10566.](#)

The emergence of a new pandemic, known as COVID-19, has touched various sections of the supply chain (SC). Since then, numerous studies have been conducted on the issue, but the need for a holistic review study that highlights the gaps and limits of previous research, as well as opportunities and agendas for future studies, is palpable. Through a systematic literature review on blockchain technology (BCT) deployment in supply-chain management (SCM) concerning the COVID-19 pandemic, this research seeks to add to the content of previous studies and to enlighten the path for future studies. Relevant papers were found using a variety of resources (Scopus, Google Scholar, Web of Science, and ProQuest). Seventy-two articles were systematically selected, considering the PRISMA procedure, and were thoroughly analyzed based on BCT, methodologies, industrial sectors, geographical, and sustainability context. According to our findings, there is a significant lack of empirical and quantitative methodologies in the literature. The majority of studies did not take specific industries into account. Furthermore, the articles focusing on the sustainability context are few, particularly regarding social and environmental issues. In addition, most of the reviewed papers did not consider the geographical context. The results indicate that the deployment of BCT in several sectors is not uniform, and this utilization is reliant on their services during the COVID-19 pandemic. Furthermore, the concentration of research on the impacts of the BCT on SCM differs according to the conditions of various countries in terms of the consequences of the COVID-19 pandemic. The findings also show that there is a direct relationship

between the deployment of BCT and sustainability factors, such as economic and waste issues, under the circumstances surrounding COVID-19. Finally, this study offers research opportunities and agendas to help academics and other stakeholders to gain a better knowledge of the present literature, recognize aspects that necessitate more exploration, and drive prospective studies.

[Bhavsar, A., Diallo, C., Ülkü, M.A. \(2021\). Towards sustainable development: Optimal pricing and sales strategies for retailing fair trade products. \*Journal of Cleaner Production\*, 286, 124990.](#)

In response to heightened pressure from customers who embrace sustainability, and in compliance with the Sustainable Development Goals set by the United Nations, an increasing number of organizations have implemented, mostly within their supply chains, initiatives to reduce their environmental impacts while enhancing their social responsibilities and economic well-being. As such, offering Fair Trade (FT) alternatives on their shelves provides an opportunity for retailers to better connect with and support their suppliers in the developing world by guaranteeing higher purchase prices, and enhanced education and well-being. This could be achieved by transitioning to or integrating with a FT Supply Chain (FSC). To that end, this paper studies, from the perspective of a profit-maximizing and socially-aware retailer that wants to expand its conventional product (C-product) offering by adding an FT option (F-product), the conditions under which the two competing products (F- and C-products) can be optimally priced and allocated to the available storage capacity. Our demand model segments the market with respect to customers' willingness to pay a higher premium for the F-product relative to the C-product, and their derived utilities. We formulate the optimization model as a convex mathematical program. To showcase the use of the optimality model, various numerical experiments are conducted to investigate the sensitivity of key parameters. To further stimulate discussion and productivity in sustainable supply chain literature, and due to their salient operating structure of FSCs, such as licensing fees, we deliberately expand on the historical background of FT, and delineate FSC from its conventional counterpart CSC. Our results show that FSCs and CSCs can be well-aligned if demands for both F- and C-products are not cannibalized, and the retailer is willing to invest in enhancing its social responsibility profile. Among others, our model informs managers about how to use pricing as a leverage, and when to sell only F-, or C-product, or a mix of both. The results confirm that it is possible to design sales strategies for the retailer such that its financial-bottom line is still not hurt while FT suppliers and workers in developing countries could benefit from high premiums from the sales of F-products, for a sustained income in disruption-prone working environments.

[Alhawari, O., Awan, U., Bhutta, M.K.S., Ülkü, M.A. \(2021\). Insights from circular economy literature: A review of extant definitions and unravelling paths to future research. \*Sustainability \(Switzerland\)\*, 13 \(2\), 859, 1-22.](#)

The circular economy (CE) has become one of the prominent topics in both natural science and management literature over the last few decades. CE is a dual-loop regenerative system that focuses on the effective and efficient utilization of resources in the ecosystem, which is beneficial to environmental and economic performance optimization. Dual CE initiatives allow firms to increased resource eco-efficiency, as well as resource effectiveness. CE has profound consequences for economic and operational advantage. This reinforces the need for reflection on the definition that may provide guidelines to assess and advance the depth and diversity of the field. We aim to provide a definitional analysis of the CE and suggest future research streams to advance the existing literature. For this purpose, we employed a systematic literature review to collect related publications in the CE. As a result of this, a total of 91 papers were selected, studied, and analyzed. We proposed a sound definition of a circular economy that includes the main identified elements, organizational planning processes,

customers and society, utilization of the ecosystem, and economic resource flows. Moreover, future direction agenda, in CE research, is suggested considering three research streams: (1) circular design as value creation and capture, (2) antecedents of key activities, and (3) consequences of key processes. There is limited empirical research conducted on CE, and much of the existing research focuses on theoretical, conceptual, and normative. A few empirical research studies are mainly cross-sectional in their focus and are confined to developing and emerging economies. We hope this study's findings will extend the field of CE, in which some of the most influential information regarding CE literature is provided. This study suggests that the development of CE initiatives plays an important role in the growing digital transformation in the value chain. There have been limited research studies in the interface of circular economy and Industry 4.0. Future research studies may investigate the extent to which digital transformation can increase the implementation of CE, and their influence on digital performance management.

Worku, A., **Ülkü, M.A.** (2021). Analyzing the impact of the COVID-19 pandemic on vegetable market supply in Northwestern Ethiopia. *Journal of Agribusiness in Developing and Emerging Economies*.

Purpose: Due to global trade and transportation, the COVID-19 pandemic has rapidly reached all corners of the world; it has most impacted the poor communities and rural areas with limited or no access to recovery. This paper aims to understand the pandemic's impact on the market supply of vegetables (agrifood) in Ethiopia and other countries in sub-Saharan Africa and to implement scientifically based recommendations that can improve the challenges caused by the pandemic and improve the livelihoods of vegetable producers. Design/methodology/approach: This study assessed the major incidents that follow the occurrence of the COVID-19 pandemic in Ethiopia with the factors that significantly influence onion market supply in the Mecha district of Northwestern Ethiopia using linear multiple regression. Findings: The study revealed that producers, processors, local collectors, cooperatives, wholesalers, retailers and consumers are the main actors. The most important difference that happened on the onion market channel after the outbreak of coronavirus was brokers were removed from the market channel after the pandemic and this saved the cost producers pay as a commission. The pandemic disrupted input distribution, extension and cooperative services and created labor scarcity. Access to market, postharvest value addition, price and marketing contract were significant factors that influence the market supply of onion. The study identified the need for policy interventions by the government to overcome the postpandemic challenges and ensure the sustainable development of onion production and marketing in the Mecha district. Research limitations/implications: The limitations of the study are primarily related to the methodology as data are collected at a single moment in time. However, the study observes that those changes after the pandemic are better understood if we collect data at different time. Therefore, the future study needs to provide longitudinal data to examine stability of response and to observe performance of the market that occur over time. Originality/value: This original research is the first to study the impacts of the COVID-19 pandemic in Northwestern Ethiopia. The data used in the analysis are primary.

Chadha, S.S., **Ülkü, M.A.**, Venkatadri, U. (2021). Freight delivery in a physical internet supply chain: an applied optimisation model with peddling and shipment consolidation. *International Journal of Production Research*.

The delivery of goods (freight) accounts for the major cost and emissions in logistics systems worldwide. The effective management of the supply chain requires logistical efficiency and sustainability. Several logistics performance measurements such as distances driven and fuel efficiency are also indicators of sustainability. As an emerging paradigm, the Physical Internet (PI) addresses logistical, societal, and

sustainability goals. However, the question remains whether some aspects of logistical efficiency in traditional logistics could be incorporated into the PI paradigm. To this effect, we examine how peddling, a consolidation strategy in traditional logistics, can enhance PI supply chain. Specifically, we formulate optimisation models and study the case of a Mexican automotive supply chain from both the PI and traditional logistics perspectives by comparing three different configurations; namely, Model P built on PI, Model S based on conventional standard peddling, and Model H, a hybrid. The hybrid Model H is optimised in a two-phase solution framework. We show via the case of a Mexican automotive supply chain that Model H outperforms others on average distance travelled and truck utilisation. Thereby, it is concluded that appropriate peddling and shipment consolidation policies may enhance PI supply chain logistics performance.

Hassan, M.S., Halbusi, H.A., Najem, A., Razali, A., Fattah, F.A.M.A., **Williams, K.A.** (2021). Risk perception, self-efficacy, trust in government, and the moderating role of perceived social media content during the COVID-19 pandemic. *Changing Societies and Personalities*, 5 (1), 9-35.

The public's actions will likely have a significant effect on the course of the novel coronavirus (COVID-19) pandemic. Human behavior is conditioned and shaped by information and people's perceptions. This study investigated the impact of risk perception on trust in government and self-efficacy. It examined whether the use of social media helped people adopt preventive actions during the pandemic. To test this hypothesis, the researchers gathered data from 512 individuals (students and academics) based in Malaysia during the COVID-19.

Al Halbusi, H., **Williams, K.A.**, Ramayah, T., Aldieri, L., Vinci, C.P. (2021). Linking ethical leadership and ethical climate to employees' ethical behavior: the moderating role of person-organization fit. *Personnel Review*, 50 (1), 159-185.

Purpose: With the growing demand for ethical standards in the prevailing business environment, ethical leadership has been under increasingly more focus. Based on the social exchange theory and social learning theory, this study scrutinized the impact of ethical leadership on the presentation of ethical conduct by employees through the ethical climate. Notably, this study scrutinised the moderating function of the person-organisation fit (P-O fit) in relation of ethical climate and the ethical conduct of employees. Design/methodology/approach: To evaluate the research hypotheses, two-wave data were collected from 295 individuals who are currently employed in various Iraqi organizations (i.e. manufacturing, medical and insurance industries). Findings: In line with the hypotheses, the outcomes from a sample of 295 workers working in different Iraqi entities exhibited a positive relation between the ethical behaviour of leaders and the ethical conduct of employees in the ethical climate. Moreover, it was observed that the P-O fit of employees moderated the relationship between ethical climate and the ethical conduct of employees such that the relationship was more robust for those with a high P-O fit in comparison to those with a low P-O fit. Research limitations/implications: The primary limitation of this study is in the data, which was obtained from a single source. Although the study conducted two surveys and utilised a mediation and moderation variables model that was less likely to be influenced by common method bias (CMB) (Podsakoff et al., 2012), one cannot completely rule out CMB. Apart from the potential effects of the CMB, the consistency of the empirical findings could have also been compromised since self-reported data were utilised in measuring ethical behaviour, which can be a very complex and sensitive issue. For this reason, the social desirability response bias cannot be ruled out completely. When possible, future studies must gather data from multiple sources. Furthermore, supervisors must evaluate the ethical behaviour of employees. Another limitation was that the findings of this study were based on a sample in a Middle Eastern cultural context such as in Iraq. Perhaps, the



particular cultural features of this context, which encompassed, among other things, a strong adherence to religious values (Moaddel, 2010), could have influenced the findings of this study. It is true that the effects of differences (P–O fit) are highly likely to replicate across cultural contexts (Triandis et al., 1988). However, it can be seen that further studies are needed to evaluate the context-sensitivity of these findings (Whetten, 2009) by analysing other cultures, where the importance of religiosity is on the decline (i.e. in Western countries, Ribberink et al., 2018) or where the cultural features are very much different from those that apply to Iraq. Lastly, other external factors were not taken into account by this study as it tried to explain ethical behaviour. Ethics is a highly complex subject and is influenced by numerous variables at the organisational, individual and external environment levels. Thus, caution must be observed when making inferences from the present study which, to a certain degree, offered a simplified version of ethical behaviour by concentrating on a few variables such as the Arab culture's traditional ideology, which dominates even science (Abu Khalil, 1992). In addition, there are the political conflicts in the Middle Eastern cultural context such as what is happening in Iraq (Harff, 2018). Thus, it is important to include such aspects in future researches. Practical implications: In terms of management, the findings send a clear signal to those in the upper echelon that, without ignoring the issue of ethics in organizations, employees are a critical aspect to be taken into account to encourage ethical behaviour at the workplace. This study has important practical implications. First, this study determined that ethical leadership (here, of the supervisors) positively influences the behaviour of subordinates (refers to the supervisors here); this in turn further improves the ethical behaviour of employees. It is vital that managers or supervisors are motivated to practice ethical leadership because they directly influence the employees. It has been suggested that top managers, especially chief executive officers, have the ability to shape the ethical climate, which also influences the ethical behaviour of employees further. This study offered several feasible ways that managers can apply to achieve that. In particular, top managers may utilise the ethical climate as a way of communicating the ethical values that they have to their subordinates, thereby serving as a motivation for the subordinates to adopt an ethical behaviour. It was also suggested by this study that ethical climate and the P–O fit may, to some degree, substitute each other as they influence the ethical behaviour of employees. Therefore, firms that were identified to have a low level of ethical standards, practices, and policies, at least from the employees' perspective, are better poised to conduct ethical issues in order to construct the ethical behaviour of their subordinates. More importantly, it is highly essential that the value congruence between an organization and its followers be considered. Social implications: This study highlighted the notion of ethics and how it's essential for society. Ethics refer to the norms, standards, and values that direct the behavior of an individual. Ethical behaviour is vital in society because we need to be treated with respect as human beings. Originality/value: This study responds to recent calls for more research to identify factors which may strengthen or mitigate the influence ethical behavior in the workplace such as ethical leadership, ethical climate and Person–Organization.

**Yu, B., Vahidov, R., Kersten, G.E. (2021). Acceptance of technological agency: Beyond the perception of utilitarian value. *Information and Management*, 58 (7), 103503.**

Using an agency lens, this paper discusses a special human-computer relation, namely technological agency, in which users delegate social tasks to autonomous computing-artifacts (i.e., technological agents) who act on behalf of the users in the social sphere. In this respect, users treat the technological agents differently from traditional computer-enabled tools and assess them from a relational perspective. We argue that control and restrictiveness together shape users' perceived relation with technological agents and influence their acceptance, in addition to their perceived utilitarian value of the technology. An experiment using a delegated e-negotiation scenario was conducted. Overall, the results support the above proposition.

[Yu, B., Kersten, G.E., Vahidov, R. \(2021\). An experimental examination of credible information disclosure, perception of fairness, and intention to do business in online multi-bilateral negotiations. \*Electronic Markets\*.](#)

Inter-firm negotiations are often non-discrete: they are not isolated exchange episodes, but part of an ongoing process of building strategic relationships between the firms. This view posits a challenge to the design and application of negotiation mechanisms in e-markets supporting business-to-business exchanges. The assessment of the mechanisms needs to include both the impacts within each discrete exchange episode and those shaping the future of the inter-firm relationships. We argue that strategies of information revelation implemented with negotiation mechanisms can influence participants' fairness perceptions, which can further affect business relationships. The paper examines both substantive and subjective measures in an experiment involving two multi-bilateral negotiations with distinct information disclosure strategies. The results show that the revelation of the best offer affects participants' perceived fairness which, in turn, positively influences intention to do business. The findings have implications for both the design and use of negotiation mechanisms where inter-firm relationships are concerned.

[Sun, W., Zhao, Y., MacLean, L. \(2021\). Real options in a duopoly with jump diffusion prices. \*Asia-Pacific Journal of Operational Research\*, 38 \(6\), 00093.](#)

This paper analyzes irreversible investments in technology under asymmetric duopoly. Asset prices are defined by a diffusion with Poisson jumps. Assuming negative externality for profit flows, we develop a real options and game theoretic valuation model to evaluate the optimal investment strategies under interaction. Three types of equilibrium, i.e., simultaneous equilibrium, preemptive equilibrium, and sequential equilibrium, are attainable depending on the firms' competitive advantage and first-mover advantage. The role of a firm, as "leader", "follower", or "simultaneous entrant", is analyzed both exogenously and endogenously. We find that preemptive competition lowers both firms' profits from the investments in the technology. Numerical examples illustrate the key results.

## SCHOOL OF INFORMATION MANAGEMENT

[Conrad, C., Newman, A. \(2021\). Measuring mind wandering during online lectures assessed with EEG. \*Frontiers in Human Neuroscience\*, 15, 697532.](#)

Mind wandering can inhibit learning in multimedia classrooms, such as when watching online lectures. One explanation for this effect is that periods of mind wandering cause learners' attention to be redirected from the learning material toward task-unrelated thoughts. The present study explored the relationship between mind wandering and online education using electroencephalography (EEG). Participants were asked to attend to a 75-minute educational video lecture, while task-irrelevant auditory tones played at random intervals. The tones were of two distinct pitches, with one occurring frequently (80%) and the other infrequently (20%). Participants were prompted at pseudo-random intervals during the lecture to report their degree of experienced mind wandering. EEG spectral power and event-related potentials (ERP) were compared between states of high and low degrees of self-reported mind wandering. Participants also performed pre/post quizzes based on the lecture material. Results revealed significantly higher delta, theta and alpha band activity during mind wandering, as well as a decreased P2 ERP amplitude. Further, learning scores (improvement on quizzes pre to post) were lower among participants who reported higher degrees of mind wandering throughout the video. The results are consistent with a view that mind wandering during e-learning is characterized by a shift in attention away from the external world and toward internal thoughts, which may be a cause of reduced learning.

[Diaz, G. O., Conrad, C. \(2021a\). Online communities and dating apps: The effects of social presence, trust, and Covid-19. \*27th Annual Americas Conference on Information Systems, AMCIS 2021.\*](#)

The Covid-19 pandemic changed the dynamics of socialization by restricting one of its main avenues: in-person gatherings. This pushed people towards digital technology to fulfill their socialization needs. In this paper, we take steps to explore whether features of online communities can contribute to innovative dating app designs, given how dating app business models currently focus on independent one-on-one interactions. We conducted an exploratory survey of 200 participants concerning dating app use habits, perceptions of dating apps, as well as degrees of trust, social presence, and perceived ease of finding dates using three dating methods. We found that social presence and trust consistently predicted the perceived ease of finding dates for each method, and that the perceived ease of finding dates influenced whether participants reported increased use of the method during Covid-19. Together with the growth in online community participation, these results suggest that dating app platforms might benefit from incorporating social features in their designs.

[Moreland, H. R., de Santo, E. M., MacDonald, B. H. \(2021\). Understanding the role of information in marine policy development: establishing a coastal marine protected area in Nova Scotia, Canada. \*Facets\*, 6, 1539-1569.](#)

Canada has expanded its marine protected area (MPA) coverage in line with the Aichi Biodiversity Target of protecting 10% of its marine territory by 2020. In 2018, a consultation process was launched to designate an Area of Interest surrounding the Eastern Shore Islands area off the coast of Nova Scotia, as the potential 15th Oceans Act MPA in Canada (DFO 2021a). This region has a fraught history with external conservation interventions and, consequently, there was a significant level of local mistrust in the process. This study explored the role of information in the consultation process and how it interplayed with the historical context, political pressures, trust, and mistrust among stakeholders and

rightsholders. Drawing on interviews, a detailed desktop analysis, and participant observation at consultation meetings, this paper describes what worked well and what could be improved with respect to the sources of information used and the channels through which stakeholders and rightsholders accessed it. This case study demonstrates that while preferences for information sources and channels are context specific and varied, they are inherently personal and influenced by shared histories, trust, and individual beliefs.

[Aagaard, K., Mongeon, P., Ramos-Vielba, I., Thomas, D. A. \(2021\). Getting to the bottom of research funding: Acknowledging the complexity of funding dynamics. \*PLoS ONE\*, 16\(5 May\).](#)

Research funding is an important factor for public science. Funding may affect which research topics get addressed, and what research outputs are produced. However, funding has often been studied simplistically, using top-down or system-led perspectives. Such approaches often restrict analysis to confined national funding landscapes or single funding organizations and instruments in isolation. This overlooks interlinkages, broader funding researchers might access, and trends of growing funding complexity. This paper instead frames a bottom-up approach that analytically distinguishes between increasing levels of aggregation of funding instrument co-use. Funding of research outputs is selected as one way to test this approach, with levels traced via funding acknowledgements (FAs) in papers published 2009-18 by researchers affiliated to Denmark, the Netherlands or Norway, in two test research fields (Food Science, Renewable Energy Research). Three funding aggregation levels are delineated: At the bottom, funding configurations of funding instruments co-used by individual researchers (from single-authored papers with two or more FAs); a middle, funding amalgamations level, of instruments co-used by collaborating researchers (from multi-authored papers with two or more FAs); and a co-funding network of instruments co-used across all researchers active in a research field (all papers with two or more FAs). All three levels are found to include heterogenous funding co-use from inside and outside the test countries. There is also co-funding variety in terms of instrument type (public, private, university or non-profit) and origin (domestic, foreign or supranational). Limitations of the approach are noted, as well as its applicability for future analyses not using paper FAs to address finer details of research funding dynamics.

[Mongeon, P., Brown, A., Dhaliwal, R., Hill, J., Matthews, A. \(2021\). A bibliometric analysis of race-related research in LIS. \*Education for Information\*, 37\(2\), 231-246.](#)

This special issue on race relations and racial inequity in Library and Information Science (LIS) is a response to a recent wave of advocacy, activism, and protests. Its explicit purpose is to address the lack of research on race and inequity within our field. The purpose of this contribution to the issue is to substantiate that statement by performing a bibliometric analysis of the last 40 years of LIS scholarship to quantify the amount of attention given to race and racial inequality over that period. We find that despite an important increase in BIPOC-related research in LIS, the numbers remain quite low with approximately 2% of LIS publications containing terms related to racial inequality and BIPOC communities, and this research also tends to be less cited than the average LIS papers in the same area. We also find that this research is present in several areas of the field, although unevenly distributed across them. The trends presented in this paper may help when discussing sensitive issues regarding systematic discrimination, help create and sustain momentum towards change, and address the persistent lack of diverse perspectives and approaches across LIS scholarship and practice.

[Mongeon, P., Siler, K., Archambault, A., Sugimoto, C. R., Larivière, V. \(2021\). Collection development in the era of big deals. \*College and Research Libraries\*, 82\(2\), 219-236.](#)

Drawing on an original methodology using citations, downloads, and survey data, this paper analyzes journal usage patterns across 28 Canadian universities. Results show that usage levels vary across disciplines and that different academic platforms varied in their importance to different institutions, with for-profit platforms generally exhibiting lower usage. These results suggest economic inefficiencies exist in “big deal” academic journal subscriptions for universities, as most journals in such bundles are seldom or never used. We recommend that universities coordinate resource sharing and negotiate strategies with academic journal expenditures based on shared interests and usage trends.

Sainte-Marie, M., Pedersen, A. D., **Mongeon, P.** (2021). Reporting transparency in analysis of variance assumption testing. *Proceedings of the International Conference on Scientometrics and Informetrics*, Leuven, Belgium, 967-978.

ANOVA models in general are valid only insofar as both homoscedasticity and multiple comparisons between groups are controlled for. While recent studies suggest that researchers in various disciplines seldom comply with these requirements, lack of rigor in methodological reporting makes a proper, large-scale, and transdisciplinary assessment of the situation impossible. Given this situation, the present paper attempts a large-scale and transdisciplinary assessment of statistical reporting transparency in ANOVA-related papers, using customized regular expressions on the full-text of articles published in Elsevier journals. Results show that, beyond important variations at multiple disciplinary levels, reporting transparency in the testing of ANOVA statistical assumptions is generally lacking, as a minority of ANOVA-related papers refer to either homoscedasticity or multiplicity correction. Also, articles from higher-quartile journals tend to report statistical assumptions more thoroughly than those from lower-quartile journals, regardless of discipline or subdiscipline.

Simard, M.-A., Ghiasi, G., **Mongeon, P.**, Larivière, V. (2021). Geographic differences in the uptake of open access. *Proceedings of 18th International Conference on Scientometrics & Informetrics*, 1033-1038.

Open Access (OA) is a process that aims to make research output freely available on the internet. The OA movement originated from the growing demand to make research more accessible worldwide. It has been gaining a lot of momentum, with the implementation of several OA policies by funding institutions and the development of several new platforms that facilitate the publication of OA content at low cost. Studies have shown that nearly half of the scientific literature could be available online for free, but only a few have compared the use of OA literature at the country level and from a worldwide perspective. Along these lines, this study aims to provide a global picture of the current state of OA adoption by countries, using two indicators: publications in OA and references to articles in OA. We find that, on average, low-income countries are publishing and citing OA at the highest rate, while upper middle-income countries and higher-income countries publish and cite OA articles at below world-average rates. These results highlight national differences in OA uptake and suggest that more OA initiatives at the institutional, national and international levels are needed to support a wider adoption of open scholarship

Ferreira, M. R., **Mongeon, P.**, Costas, R. (2021). Large-scale comparison of authorship, citations, and tweets of Web of Science authors. *Journal of Altmetrics*, 4(1), 1.

Social media platforms are increasingly part of the academic workflow. However, there is a lack of research that examines these activities, particularly at the author level. This paper explores the activity of researchers in the Twittersphere by analyzing a large database of Web of Science authors

systematically identified on Twitter using data from Altmetric.com. Using this information, this paper explores and compares patterns of tweeted and self-tweeted publications with other academic activities, such as citations, self-citations, and authorship at the author level. This paper also compares the thematic orientation among these different activities by analyzing the similarity of the research topics of the publications tweeted, cited, and authored. The results show that the productivity and impact of researchers, as defined by conventional bibliometric indicators, are not correlated to their popularity on the Twitter platform and that scholars generally tend to tweet about topics closely related to the publications they author and cite. These findings suggest that social media metrics capture a broader aspect of the academic workflow that is most likely related to science communication, dissemination, and engagement with wider audiences and that differs from conventional forms of impact as captured by citations. Areas for further exploration are also proposed.

Olson, L., Audas, J., Bourret, G., Fitzgerald, K., Roeschley, A., **Mongeon, P.** (2021). Is archival scholarship for everybody? A bibliometric analysis of gender and knowledge production in the archival field, 1981–2019. *Proceedings of the 2021 conference of the Canadian Association for Information Science*, Edmonton, 6-10 June 2021.

Analyzing over 7,000 academic journal articles spanning four decades, this research uses bibliometric methods to assess the hypothesis that the archival field is a feminized discipline. First, an explanation of our dataset is presented, followed by the results of the proportion of men and women amongst the authors for which we were able to assign a perceived gender. This analysis shows a gradual rise of female-perceived authorship. We then compare these results to the differences in citations between papers with female and male first authors, which shows no clear trend.

Fitzgerald, K., Bourret, G., Audas, J., Olson, L., Roeschley, A., **Mongeon, P.** (2021). The established archives: a bibliometric overview of archival research. *Proceedings of the 2021 conference of the Canadian Association for Information Science*, Edmonton, 6-10 June 2021.

This research uses bibliometric methods to trace the interdisciplinary nature of archival studies and the ‘archival multiverse’ through the analysis of academic journal articles. We first analyzed the networks of archival papers included in this study and the identified communities within it. We then analyzed the most frequent words and citations for each network. This analysis provides an overview of the structure of the archival studies in recent decades, which points to a field that is slowly developing its own identity.

Melnick, K., Moharana, T., Toupin, R., Gone, P., **MacDonald, B., Mongeon, P.** (2021). The intersection of shark research, policy and the public: a bibliometric and altmetric view. *Proceedings of the 2021 conference of the Canadian Association for Information Science*, Edmonton, 6-10 June 2021.

Sharks have traditionally been portrayed as dangerous animals by modern media, contributing to a negative perception in the public eye. On one hand, despite some species being listed as critically endangered, news about the perceived risk of sharks for humans protrudes more than other topics. On the other hand, conservation topics tend to focus on specific topics, such as finning, highlighting the divergence between scientific and mediatic discourses about sharks. Our research compares the attention of shark research topics across citations, tweets, news and policy mention to assess the salience of specific themes. We find that citations are evenly distributed across research communities, tweets and policy mentions exhibit a significant focus on conservation, and news mentions tend to focus on more sensationalist topics such as shark attacks or the repercussions of fisheries on coral reefs.

**Mongeon, P.,** Brown, A., Dhaliwal, R., Hill, J.A., Matthews, A. (2021). A bibliometric analysis of race-related research in LIS. *Proceedings of the 2021 conference of the Canadian Association for Information Science*, Edmonton, 6-10 June 2021.

The purpose of this work in progress is to quantify the amount of attention given to questions of racial inequity experienced by BIPOC in LIS research. We find that despite a recent surge in BIPOC-related research output, the publications are low in numbers and tend to receive fewer citations than other work in the same research area. BIPOC-related research is present but unevenly distributed across several areas of the field. These trends may help create and sustain momentum towards addressing the persistent lack of diversity and equity in LIS.

Simard, M.A., Asubiaro, T., **Mongeon, P.** (2021). The burden of article processing charges on Canadian universities. *Proceedings of the 2021 conference of the Canadian Association for Information Science*, Edmonton, 6-10 June 2021.

The question about the cost of access to scholarly resources is usually answered by focusing on subscription cost. This study highlights the article processing charges (APCs) paid by Canada's research institution as an additional scholarly resource. Unpaywall database was queried with the DOIs of CARL member universities' publication indexed in the Web of Science. We find that while Open Access should in principle reduce the cost of access to scholarly literature, we are rather in a situation where both the cost of access and the cost of publishing are increasing simultaneously.

Munroe-Lynds, C.-L., Simard, M.-A., Li, V., McClean, E., **Mongeon, P.** (2021). Mapping the Canadian library and information science research landscape. *Proceedings of the 2021 conference of the Canadian Association for Information Science*, Edmonton, 6-10 June 2021.

This work-in-progress paper aims to map the scholarship produced by the eight Canadian Library and Information Science (LIS) schools. After using the citation network to divide publications into several research areas, we analyze how the research output of different LIS schools is distributed across these areas, in an attempt to shed light on the schools' specificities and commonalities and how each school contributes to the global picture of Canadian LIS research.

Campbell-Yeo, M., Dol, J., Richardson, B., McCulloch, H., Hundert, A., Foye, S., Dorling, J., Afifi, J., Bishop, T., Earle, R., Elliott Rose, A., Inglis, D., Kim, T., Leighton, C., MacRae, G., Melanson, A., Simpson, D. C., **Smit, M.**, Whitehead, L. (2021). A co-design of clinical virtual care pathways to engage and support families requiring neonatal intensive care in response to the COVID-19 pandemic (COVES study). *Journal of Neonatal Nursing*, 27(6), 463-470.

Background: In response to the COVID-19 pandemic, family presence restrictions in neonatal intensive care units (NICU) were enacted to limit disease transmission. This has resulted in communication challenges, negatively impacting family integrated care. Aim: To develop clinical care pathways to ensure optimal neonatal care to support families in response to parental presence restrictions imposed during the COVID-19 pandemic. Methods: An agile, co-design process utilizing expert consensus of a large interdisciplinary team and focus groups and semi-structured interviews with families and HCPs were used to co-design clinical virtual care pathways. Results: Three clinical virtual care pathways were co-designed: (1) building and maintaining relationships between family and healthcare providers; (2) awareness of resources; and (3) standardized COVID-19 messaging. Modifications were made to

optimize uptake and utilization in the clinical areas. Conclusion: Clinical care virtual pathways were successfully co-designed to meet these needs to ensure more equitable family-centered care.

McCulloch, H., Campbell-Yeo, M., Richardson, B., Dol, J., Hundert, A., Dorling, J., Whitehead, L., MacRae, G., Bishop, T., Afifi, J., Earle, R., Rose, A. E., Foye, S., Inglis, D., Kim, T., Leighton, C., Melanson, A., Simpson, D. C., **Smit, M.** (2021). The impact of restrictive family presence policies in response to COVID-19 on family integrated care in the NICU: A qualitative study. *Health Environments Research and Design Journal*.

**Objectives:** To conduct a needs assessment with families and their healthcare team to understand the impact of restrictive family presence policies in the neonatal intensive care unit (NICU) in response to COVID-19. **Background:** In response to the COVID-19 pandemic, significant restrictive family presence policies were instituted in most NICUs globally intended to protect infants, families, and HCPs. However, knowledge on the impact of the stress of the pandemic and policies restricting family presence in the NICU on vulnerable neonates and their families remains limited. **Methods:** Individuals were eligible to participate if they were a caregiver of an infant requiring NICU care or a healthcare provider (HCP) in the NICU after March 1, 2020. Semi-structured interviews were conducted using a virtual communication platform, and transcripts were analyzed using inductive thematic qualitative content analysis. **Results:** Twenty-three participants were interviewed (12 families and 11 HCPs). Three themes emerged: (1) successes (family-integrated care, use of technology), (2) challenges (lack of standardized messaging and family engagement, impact on parental wellbeing, institutional barriers, and virtual care), and (3) moving forward (responsive and supportive leadership). **Conclusions:** Our findings highlight the significant impact of family restrictions on the mental well-being of families, physical closeness with parents, and empathetic stress to HCPs. Further study of potential long-term impact is warranted.

Proulx, M., Ross, L., Macdonald, C., Fitzsimmons, S., **Smit, M.** (2021). Indigenous traditional ecological knowledge and ocean observing: A review of successful partnerships. *Frontiers in Marine Science*, 8.

Understanding and management of the marine environment requires respect for, and inclusion of, Indigenous knowledge, cultures, and traditional practices. The Aha Honua, an ocean observing declaration from Coastal Indigenous Peoples, calls on the ocean observing community to “formally recognize the traditional knowledge of Indigenous peoples,” and “to learn and respect each other’s ways of knowing.” Ocean observing systems typically adopt open data sharing as a core principle, often requiring that data be Findable, Accessible, Interoperable, and Reusable (FAIR). Without modification, this approach to Traditional Ecological Knowledge (TEK) would mean disregarding historical and ongoing injustices and imbalances in power, and information management principles designed to address these wrongs. Excluding TEK from global ocean observing is not equitable or desirable. Ocean observing systems tend to align with settler geography, but their chosen regions often include Indigenous coastal-dwelling communities that have acted as caretakers and stewards of the land and ocean for thousands of years. Achieving the call of Aha Honua will require building relationships that recognize Indigenous peoples play a special role in the area of ocean stewardship, care, and understanding. This review examines the current understanding of how Indigenous TEK can be successfully coordinated or utilized alongside western scientific systems, specifically the potential coordination of TEK with ocean observing systems. We identify relevant methods and collaborative projects, including cases where TEK has been collected, digitized and the meta(data) has been made open under some or all the FAIR principles. This review also highlights enabling factors that notably contribute to successful outcomes in digitization, and mitigation measures to avoid the decontextualization of TEK. Recommendations are primarily value- and process-based, rather than action-based, and acknowledge the key limitation that this review is



based on extant written knowledge. In cases where examples are provided, or local context is necessary to be concrete, we refer to a motivating example of the nascent Atlantic Regional Association of the Canadian Integrated Ocean Observing System and their desire to build relationships with Indigenous communities.

[Richardson, B., Campbell-Yeo, M., Smit, M. \(2021\). Mobile application user experience checklist: A tool to assess attention to core UX principles. \*International Journal of Human-Computer Interaction\*, 37\(13\), 1283-1290.](#)

A user experience checklist is not a substitute for an informed expert assessment or for user studies. But what does one do when there are too many apps and not enough experts? A guideline for novice assessors can aid in assessing large numbers of apps quickly, but there are few tools assessing the quality of user experience in information-presenting mobile applications (apps). The Mobile Application User Experience Checklist (MAUX-C) is an evidence-informed, user-friendly tool that measures the overall UX quality of apps. This paper describes the development and series of preliminary validation of MAUX-C. While first developed to be used as a standardized evaluation measure when conducting systematic reviews of information-presenting mobile apps, it could also be used as a reference during app development. This paper emphasizes that in addition to high-quality information, information-presenting apps need to provide a high-quality user experience to be taken seriously in the post-truth era.

[Toze, S., Roy, J., Sharaput, M., Wilson, L. \(2021\). Smart technologies, digital competencies, and workforce development: An examination of the Government of Canada's current and future capacities. \*International Journal of Public Administration in the Digital Age \(IJPADA\)\*, 8\(1\), 1-19.](#)

A mixed methods case study of the Government of Canada provides a lens through which the skills development and training and development challenges confronting the public sector in an era of digitization and smart technologies can be examined. Findings related to four key inter-related themes emerged from the analysis of survey and interview data: i) current skills sufficiencies will be challenged by coming demands; ii) digital transformation is recognized as critical, but requires significant cultural and organizational change; iii) employees are uncertain about the use of smart technologies; and iv) there is a demand for expanded training opportunities to address these challenges. These findings reflect the broader context, in particular the increasing importance of hybrid skill sets that transcend traditional boundaries between technical and non-technical functions and skills, and the need for more open and integrative venues for discussion of and training regarding digital initiatives.

[Music, J., Finch, E., Gone, P., Toze, S., Charlebois, S., Mullins, L. \(2021\). Pandemic Victory Gardens: Potential for local land use policies. \*Land Use Policy\*, 109, 105600.](#)

This viewpoint examines citizen empowerment by gardening in times of crisis, namely, the adoption of the idea of Victory Gardens as a means of resistance to COVID-19. Fear of the collapse of the Canadian food chain supply at the beginning of the pandemic led to an increase in urban gardening. The government-created Victory Garden program of the Second World War urged citizens to contribute to the war effort by growing their own food. Social media use of hashtags associated with victory gardening are shown as citizen engagement or intent to engage with local gardening programs and home food production. A scaled-down victory garden-like program might see a resurgence in urban geographies, if local planning policies and government-led community gardening efforts supported growth in this area.

## SCHOOL OF PUBLIC ADMINISTRATION

**Brown, M.P., White, J. (2021),** *Motivational psychology and the call to professional public service in Canadian Public Administration*, 64, 335-359.

This article explores the phenomenon of the call to professional public service in Canada. It draws on the testimonials of exemplars in Canada and elsewhere, and research findings from the fields of prosocial behaviour and public service motivation (PSM), and especially from motivational psychology, with its concepts of “flow” and “element,” to shed light on the dynamics of the call and steps professional public services can take to best mobilize individuals responding to it. The conclusion suggests there should be greater acknowledgement of the reality of the call, embeds the call in PSM theory, and sets out an agenda for research.

**Boyd, B., Wesley, J.J., Rounce, A., Levasseur, K., Caron, I. (2021).** *The public servant’s role in democracy. Canadian Public Administration*, 64 (3), 421-436.

This research note reports on the findings from a survey conducted in partnership with the Institute of Public Administration of Canada (IPAC). Despite robust debate among public administration experts about the role public servants should play in Canadian democracy, there has yet to be a systematic study of how public servants themselves view democracy and their role within it. We ask: What role do public servants play in democracy? The survey questions public servants about their views and contributions to democracy to gain a better understanding of what role they are playing in Canada’s system.

**Charlebois, S., Smook, M., Wambui, B.N., Somogyi, S., Racey, M., Fiander, D., Music, J., Caron, I. (2021).** *Can Canadians afford the new Canada’s Food Guide? Assessing barriers and challenges. Journal of Food Research*, 10 (6), 1-22.

The objective of this study was to investigate Canadian’s awareness and use of Canada’s Food Guide and to explore barriers to adopting the recommendations. We also conducted a cost analysis to measure the affordability of the 2019 Food Guide compared to the previous version. Although 74% of Canadians were aware of the new Food Guide, it ranked low as a preferred source of information; as well, affordability is a top concern when implementing the recommendations. However, eating based on the 2019 Food Guide is more affordable than the 2007 version at food prices in either year. These results bring into question the influence Food Guides have on population’s health behaviour.

**Music, J., Charlebois, S., Spiteri, L., Farrell, S., Griffin, A. (2021).** *Increases in household food waste in Canada as a result of COVID-19: An exploratory study. Sustainability (Switzerland)*, 13 (23), 13218.

The era of the COVID-19 pandemic has resulted in a variety of individual lifestyle and behavioural changes, and could, therefore, potentially involve a shift towards more sustainable food systems. This research was conducted through an online survey of cross-sectional design. We surveyed 8,272 Canadians in August of 2020. Participants answered questions about socio-demographic food waste amounts in kilograms, and food-waste-management behaviours. In this exploratory study, we assessed the relationships between socio-demographic variables, and self-reported food-waste behaviours through two-tailed significance testing. Results indicated that Canadian households self-reported an insignificant decrease in food waste during the pandemic. Respondents reported allowing food to expire, not utilizing leftovers, and not finishing meals. Understanding food-waste behaviour changes is

key to designing effective mitigation strategies to reduce household food waste and to minimize the environmental consequences with which food waste is associated.

**Charlebois, S., Music, J. (2021).** SARS-CoV-2 pandemic and food safety oversight: Implications in Canada and coping strategies. *Foods*, 10 (10), 2241.

The SARS-CoV-2 pandemic has created enormous societal disruptions in the Western world, including Canada, with serious implications for food safety. Since the start of the pandemic, many scholars have investigated the issue of food safety through different lenses. In this review, two research thrusts were identified, the epidemiology of the virus and food safety oversight. Both were challenged by the pandemic in Canada and elsewhere. In this paper, we first present how Canada experienced the pandemic. We then present how epidemiology and food safety oversight were affected by the virus and how the spread exposed gaps in Canada's food safety system. We explain how Canada was not adequately prepared to face the food safety challenges posed by SARS- CoV-2. The review ends with an explanation on how risk perceptions will be altered by the pandemic in Canada and how food safety systems will adjust to better anticipate systemic risks in the future.

**Music, J.T., Burgess, J., Charlebois, S. (2021).** Finding alternatives: Canadian attitudes towards novel foods in support of sustainable agriculture. *Future of Food: Journal on Food, Agriculture and Society*, 9 (3), 1-16.

Global agriculture and farming practices account for roughly a quarter of total atmospheric emissions. Protein agriculture is especially prone to greenhouse gas emissions. There is a need to find alternatives for protein forms and sustainable practices in providing alternative protein sources. However, sustainable agricultural practices must consider consumer behaviour and attitude towards switching protein sources. In this quantitative study, a survey of 993 Canadians was carried out to better understand the likelihood of adoption of alternative proteins, cultured meat, insects and jellyfish; attitudes towards sustainable agriculture were also explored. Results show that novel foods that imitate traditional protein sources have a higher acceptance rate than those not part of the cultural food landscape. There is no evidence that consumers would switch from traditional protein sources when given more protein source options, calling into question the environmental efficacy of novel food offerings. This suggests that investment in alternative proteins as sustainable agriculture requires consumer engagement to see widespread success.

**Charlebois, S., Juhasz, M., Music, J., Vézeau, J. (2021).** A review of Canadian and international food safety systems: Issues and recommendations for the future. *Comprehensive Reviews in Food Science and Food Safety*, 20 (5), 5043-5066.

In January 2019, the Safe Food for Canadians Act/Safe Food for Canadians regulations (heretofore identified as SFCR) came into force across Canada and brought a more streamlined process to food safety practice in Canada. Food trade and production processes have evolved rapidly in recent decades, as Canada imports and exports food products; therefore it is critically important to remain aware of the latest advances responding to a range of challenges and opportunities in the food safety value chain. Looking through the optics of the recent SFCR framework, this paper places the spotlight on leading domestic and international research and practices to help strengthen food safety policies of the future. By shedding some light on new research, we also draw attention to international developments that are noteworthy, and place those in context as to how new Canadian food safety policy and regulation can be further advanced. The paper will benchmark Canada through a review study of food safety best

practices by juxtaposing (i) stated aspirations with, (ii) actual performance in leading Organization for Economic Cooperation and Development (OECD) jurisdictions.

**Charlebois, S., Music, J., Faires, S. (2021).** *The impact of Covid-19 on Canada's food literacy: Results of a cross-national survey. International Journal of Environmental Research and Public Health, 18 (10), 5485.*

Several studies of food literacy emphasise the acquisition of critical knowledge over context. This evaluation looks at how COVID-19 impacted food literacy in a country affected by the global pandemic. To our knowledge, there has been no systematic research that would allow a better understanding of the impact of uncertainty or enhanced perceived risks generated by a global crisis on the prevalence of household food literacy. This study looks at food literacy from a perspective of how an event that has domesticated many of them can alter knowledge and the relationship people have with food. A cross-national survey including 10,004 Canadians was conducted ten months after the start of the pandemic. Results show that Canadians have learned new recipes. Canadians have also taken up gardening and have relied on several sources to gather information. This study provides some evidence that Canadians have become more food literate because of the COVID-19 pandemic, but less significantly than anticipated. Practical and policy implications are presented as well as some future research directions.

**Charlebois, S., Bowdridge, E., Lemieux, J.-L., Somogyi, S., Music, J. (2021).** *Supply management 2.0: A policy assessment and a possible roadmap for the Canadian dairy sector. Foods, 10 (5), 964.*

Many believe the current Canadian dairy supply management system is outdated. Examining a recent consumer survey suggests consumers, especially among the younger generations, have mixed feelings about how the Canadian dairy industry is good for the environment or whether animals in the sector are humanely treated. The general Canadian public strongly supports financial stability for farmers, though is not fully educated about how supply management works. Issues regarding the centralization and amalgamation of the industry, making many regions underserved; recent milk dumping due to a strong shift in demand caused by COVID-19; and the popularity of dairy alternatives, show that the dairy sector in Canada is ill-prepared for major change. Dairy farmers are receiving compensation for trade deals recently ratified by the federal government, creating a precedent that will lead to an overcapitalized industry. The aim of this paper is to review the industry's current state and suggest a roadmap for a more prosperous future.

**Mullins, L., Charlebois, S., Finch, E., Music, J. (2021).** *Home food gardening in Canada in response to the Covid-19 pandemic. Sustainability (Switzerland), 13 (6), 3056.*

The lack of academic attention that home food gardening has received in Canada and the United States is surprising, given the many demonstrated benefits of community gardening programs, including increased community cohesion and resilience. The aim of the exploratory study is to explore the current surge in home food gardening and its relationship to the COVID-19 pandemic. A national survey was conducted, consisting of 43 main questions, asking respondents about their home life and food provisioning during COVID-19, the physical characteristics of their food gardens, and their attitudes and beliefs concerning home food production. Survey results show that 51% of respondents grow at least one type of fruit or vegetable in a home garden. Of those, 17.4% started growing food at home in 2020 during COVID-19 pandemic. To gain more insight into just how significant a cause the pandemic lockdown was on home food gardening, follow-up surveys and policy recommendations are suggested.

Théolier, J., Barrere, V., **Charlebois, S.**, Benrejeb Godefroy, S. (2021). Risk analysis approach applied to consumers' behaviour toward fraud in food products. *Trends in Food Science and Technology*, 107, 480-490.

Background: Consumers' trust in food control system has been shaken down by multiple food fraud events in the last decade. Initiatives have been taken to restore this trust starting with the adoption of new laws and new management methods, based on risk analysis. Little is known about consumers' knowledge and application regarding this methodology. However, consumers' risk perception has been intensively studied during food fraud events, opening up the opportunity to see if consumers' behaviors correlate with risk analysis methodology. Scope and approach: This work assumes that consumers perform a quick, instinctive, and personal risk analysis when they buy a food product. The different components of the risk analysis have been analysed and discussed separately. Available scientific data has been reviewed as well as psychosocial effects impacting consumers' risk characterization and risk management. Consumers' strategies to mitigate food fraud have been discussed to determine how they could reduce risk exposure. Key findings and conclusions: Consumers' knowledge about the concept of food fraud is limited, and their understanding of the associated risks is built on incomplete information. Besides, consumers seem to apply an incorrect risk analysis methodology. However, consumers, either favoring or reducing the weight of data, are influenced by psychosocial effects and biased information. Communication and education regarding management of food fraud and detection of food fraud are needed from a consumer standpoint. Furthermore, actions have to be undertaken on a local level, as it appears that "consumers" is not a homogenous cluster.

**Wranik, W.D.**, Gambold, L., Peacock, S. (2021). Uncertainty tolerance among experts involved in drug reimbursement recommendations: Qualitative evidence from HTA committees in Canada and Poland. *Health Policy*, 125 (3), 307-319.

Objectives: Drug reimbursement decisions often rely on health technology assessment (HTA). Increasingly, new drugs have limited clinical evidence and uncertain clinical benefit. Our goal was to describe how members of drug advisory committees and other stakeholders conceptualize and tolerate uncertainty and how they rationalize uncertainty tolerance. Methods: Our triangulated parallel design applied two qualitative methods. We interviewed 31 members of drug advisory committees in Canada and Poland about their information needs and included hypothetical scenarios with uncertain clinical benefits. Respondents speculated about their likely reimbursement recommendation. We analyzed written recommendations of the pan Canadian Oncology Drug Review for drugs with uncertain benefit and compared initial recommendations to the responses from patient and clinician groups. Results: Uncertainty tolerance varied among committee members and across jurisdictions. In the scenario analysis, 7 Canadian and 11 Polish respondents leaned against recommending a hypothetical drug with uncertain clinical benefit, whereas 5 Canadian and 5 Polish respondents leaned in favour. Those against rationalized that uncertainty increases potential harm; those in favour rationalized that patients often have no alternatives. The document analysis revealed that patients had higher uncertainty tolerance in general. Conclusions: Uncertainty tolerance varies among committee members and other stakeholders depending on their backgrounds and on the decision contexts. We argue that policy guidance around uncertainty management could improve the transparency and consistency of recommendations.

**Wranik, W.D.**, Székely, R.-R., Mayer, S., Hiligsmann, M., Cheung, K.L. (2021). The most important facilitators and barriers to the use of Health Technology Assessment in Canada: a best–worst scaling approach. *Journal of Medical Economics*, 24 (1), 846-856.

Background: Health Technology Assessment (HTA), which can support public drug reimbursement decisions will play a core function in the planned national Pharmacare program in Canada. To address existing barriers to the use of HTA, these must be ranked in order of priority. The goal of this study was to assess the relative importance of known facilitators and barriers to the use of HTA in the context of the Canadian health care system, with attention to differences between regions and stakeholder groups. Methods: We used the best–worst scaling object case approach to elicit a quantitative ranking of a list of 20 facilitators and 22 barriers. A sample of 68 Canadian HTA stakeholders, including members of expert committees, decision/policymakers, researchers/academics, and others participated in the study. Their task was to identify the most important and the least important item in 12 sub-sets of five facilitators and 14 sub-sets of five barriers. Findings: Relative Importance Scores derived via hierarchical Bayes analysis revealed relations, engagement, and contact between stakeholders as most important on both the barrier and facilitator sides. Other top-ranked facilitators included the availability of credible and relevant research. Other top-ranked barriers included inconsistencies in the evidence and limited generalizability. The availability of HTA guidelines did not rank highly on either side. The main limitation of the study was the challenge with reaching the relevant respondents; this was mitigated by involving the national HTA agency in the research. Conclusion: Canadian stakeholders consider the relationships within the HTA network among the most important. Policies should focus on strengthening these relationships. Future research should focus on the connectivity and distribution of knowledge and power within the HTA network.

## SCHOOL FOR RESOURCE AND ENVIRONMENTAL STUDIES

Macneil, J.L., Adams, M., Walker, T.R. (2021). Development of framework for improved sustainability in the Canadian port sector. *Sustainability (Switzerland)*, 13 (21), 11980.

Canada Port Authorities (CPAs) are federal entities responsible for managing Canadian Ports with local, national, and international strategic importance. Despite their connection to the Government of Canada, the CPAs inconsistently report sustainability performance and are absent from Canada's Federal Sustainable Development Strategy (FSDS)—a national strategy to operationalize the United Nation's (UN) Sustainable Development Goals (SDGs). Sustainability initiatives currently used by CPAs only contribute towards attaining 14 of 36 relevant SDG targets, suggesting the need for an additional sustainability framework to achieve the remainder of these targets. This paper proposes a port-specific framework based on disclosures from the Global Reporting Initiative (GRI) to fill performance gaps in current sustainability initiatives. Disclosures were selected in an iterative process based on literature and industry best practices. The framework provides a unified approach for both CPAs and policymakers to attain SDG targets relevant to the Canadian port sector and align sustainability performance with Canada's FSDS.

Hossain, T., Adams, M., Walker, T.R. (2021). Role of sustainability in global seaports. *Ocean and Coastal Management*, 202, 105435.

Seaports are integral hubs of maritime supply chains and contribute to socio-economic development for communities. However, seaports can create negative impacts on host communities. Adopting sustainability initiatives within seaport operations is growing rapidly, and while many seaports claim to operate green or sustainably, sustainable port initiatives and approaches are poorly described in the academic literature. This research explores relationships between existing seaport sustainability and the current narrative that exists related to sustainability improvements. Thirty-six seaports were selected from North America (NA), Europe (EU) and Asia Pacific (AP) for analysis. Twenty-five (25) pre-defined indicators were used to identify operational trends linked to sustainability claimed by seaports. Each operation was assessed using publicly available data; using a mixed methods approach, descriptive statistical analysis for sustainability initiatives was performed to assess seaport sustainability efforts. Results show that EU seaports have made more progress in adopting various sustainability initiatives compared to NA and AP seaports, despite the public narrative of most seaport executives about their commitment to manage environmental impacts and being good corporate citizens. Initiative most widely adopted include: greater emphasis on internal environmental policy and management – including third-party certification; investment in proactive environmental solutions; and enhanced stakeholder engagement.

Duraiappah, A., van Atteveldt, N., Asah, S., Borst, G., Bugden, S., Buil, J.M., Ergas, O., Fraser, S., Mercier, J., Restrepo Mesa, J.F., Mizala, A., Mochizuki, Y., Okano, K., Piech, C., Pugh, K., Ramaswamy, R., Chatterjee Singh, N., Vickers, E. (2021). The international science and evidence-based education assessment. *Science of Learning*, 6 (1), 7.

Education is indispensable for the flourishing of people from all backgrounds and stages of life. However, given the accelerating demographic, environmental, economical, socio-political, and technological changes—and their associated risks and opportunities—there is increasing consensus that our current educational systems are falling short and that we need to repurpose education and rethink

the organization of learning to meet the challenges of the 21st century. The United Nations Educational Scientific and Cultural Organization (UNESCO) “Futures of Education” initiative was formally launched at the United Nations General Assembly in 2019 to provide such a vision of education for the future. The International Scientific and Evidence-based Education (ISEE) Assessment synthesizes knowledge streams generated by different communities and stakeholders at all levels and scales and will thereby essentially contribute to re-envisioning this future of education. The overall aim of the ISEE Assessment is to pool the expertise from a broad range of knowledge holders and stakeholders to undertake a scientifically robust and evidence-based assessment in an open and inclusive manner of our current educational systems and its necessary reforms. In this commentary, we discuss the aims and goals of the ISEE Assessment. We describe how the ISEE Assessment will address key questions on the purpose of education and what, how, where and when we learn, and evaluate the alignment of today’s education and theory of learning with the current and forthcoming needs and challenges and to inform policymaking for future education.

Ma, S., **Beazley, K.F.**, Nussey, P., Greene, C.S. (2021). Assessing optimal digital elevation model selection for active river area delineation across broad regions. *Water Resources Management*, 35 (14), 4825-4840.

The Active River Area (ARA) is a spatial approach for identifying the extent of functional riparian area. Given known limitations in terms of input elevation data quality, ARA studies to date have not achieved effective computer-based ARA components delineation, limiting the efficacy of the ARA framework in terms of informing riparian conservation and management. To determine the optimal input elevation data for future ARA studies, this study tested a novel digital elevation model (DEM) smoothing algorithm and assessed ARA outputs derived from a range of DEMs for accuracy and efficiency. It was found that the tested DEM smoothing algorithm allows the ARA framework to take advantage of high-resolution LiDAR DEM and considerably improves the accuracy of high-resolution LiDAR DEM derived ARA results; smoothed LiDAR DEM in 5-m spatial resolution best balanced ARA accuracy and data processing efficiency and is ultimately recommended for future ARA delineations across large regions. The scientific findings provided by this study further enhance the efficacy of the ARA framework, and ultimately the confidence in modelled ARA outputs for application in riparian conservation and management contexts across broad geographic regions.

Jacks, F., Milošević, D., Watson, V., **Beazley, K.F.**, **Medeiros, A.S.** (2021). Bioassessment of the ecological integrity of freshwater ecosystems using aquatic macroinvertebrates: the case of Sable Island National Park Reserve, Canada. *Environmental Monitoring and Assessment*, 193 (5), 257.

Due to ubiquitous distribution of taxa, relatively low-cost and efficient sampling procedure, and known responses to environmental gradients, macroinvertebrate indicators are often a central component of biological monitoring of freshwater resources. This study examined establishing a baseline reference of benthic macroinvertebrate indicators in a biomonitoring approach as a means for monitoring the freshwater ponds of Sable Island National Park Reserve (SINPR), Canada. We compared water quality parameters monitored from 2015 to 2019 to a biomonitoring approach deployed in May, June, and August of 2019. A total of 27 taxa were recorded from the 30,226 specimens collected, with highest abundances of Corixidae, Amphipoda, Oligochaeta, and chironomid species *Polypedilum bicornatum*. We found significant variability of community structure between different months of sampling ( $p = 0.001$ ) and between ponds ( $p < 0.0001$ ). A high correlation was found between dissolved organic carbon, sulfate, and the diversity of macroinvertebrate indicators, while conductivity, ammonia, and calcium were found to be correlated with species richness. While we found that water chemistry parameters



exhibited spatial and temporal differences, the diversity of macroinvertebrate indicators is likely to be a more resilient metric for comparison between ponds. Further, our findings demonstrate that biomonitoring can be effective in systems with a low number of small, shallow, freshwater pond ecosystems. As our study deployed a high-resolution identification of biological indicators, we were able to establish a baseline reference for future monitoring as well as identify specific associations between pond water quality and biological assemblages that can be used as a context for the management of SINPR's freshwater resources. Continued monitoring of these ecosystems in future years will help to understand long-term environmental changes on the island.

Allan, J.C., **Beazley, K.F.**, Metaxas, A. (2021). Ecological criteria for designing effective MPA networks for large migratory pelagics: Assessing the consistency between IUCN best practices and scholarly literature. *Marine Policy*, 127, 104219.

Networks of Marine Protected Areas (MPAs) have been proposed as one tool for the protection of large, migratory pelagic species, but debate exists on the utility of MPAs for these species. International conservation arenas have developed criteria for effective MPA networks, with the IUCN-WCPA [1] outlining five ecological guidelines in designing resilient MPA networks. This review examines recent literature to: (1) assess the degree to which the five IUCN guidelines address large migratory at-risk pelagic species; (2) assess differences between the scientific literature and IUCN guidelines in the manner in which effective MPA networks are conceptualized for these species; (3) identify additional relevant design themes for effective conservation of migratory pelagics through MPA networks not addressed by the IUCN guidelines; and, (4) identify challenges and opportunities for the design of MPA networks for this suite of species. Results indicate that neither the literature nor the IUCN-WCPA guidelines provide comprehensive strategies for designing MPA networks for large, migratory pelagic species. The study concludes that the IUCN-WCPA guidelines can be potentially effective for these species if migratory connectivity is fully accounted for and complementary adaptive and dynamic mechanisms are developed for integration across wider seascapes and sectors at large regional and global scales. To this end, updates to the design guidelines for MPA networks are warranted, particularly with respect to connectivity, adaptive and dynamic approaches, and international collaborations. Greater clarity and consistency in the definitions and uses of the terms MPAs and MPA networks is warranted to facilitate collaborative efforts.

Buxton, R.T., Bennett, J.R., Reid, A.J., Shulman, C., Cooke, S.J., Francis, C.M., Nyboer, E.A., Pritchard, G., Binley, A.D., Avery-Gomm, S., Ban, N.C., **Beazley, K.F.**, Bennett, E., Blight, L.K., Bortolotti, L.E., Camfield, A.F., Gadallah, F., Jacob, A.L., Naujokaitis-Lewis, I., Raudsepp-Hearne, C., Roche, D.G., Soulard, F., Stralberg, D., Sadler, K.D., Solarik, K.A., Ziter, C.D., Brandt, J., McKindsey, C.W., Greenwood, D.A., Boxall, P.C., Ngolah, C.F., Chan, K.M.A., Lapen, D., Poser, S., Girard, J., DiBacco, C., Hayne, S., Orihel, D., Lewis, D., Littlechild, D., Marshall, S.J., McDermott, L., Whitlow, R., Browne, D., Sunday, J., Smith, P.A. (2021). Key information needs to move from knowledge to action for biodiversity conservation in Canada. *Biological Conservation*, 256, 108983.

To address the ongoing global biodiversity crisis, conservation approaches must be underpinned by robust information. Canada is uniquely positioned to contribute to meeting global biodiversity targets, with some of the world's largest remaining intact ecosystems, and a commitment to co-application of Indigenous ways of knowing alongside scientific, socioeconomic, and other approaches. We elicited input from experts across a range of disciplines to identify the key information needed to advance policy and management actions to conserve biodiversity in Canada. Experts concluded that, in many cases, a lack of information is not the major barrier to biodiversity conservation; instead, mechanisms to

translate information into action are most urgently needed. Recognizing multiple ways of knowing, especially Indigenous knowledge systems, will be critical to support the transformative change needed to conserve biodiversity at a national scale. Collaboration among natural, social and data scientists can facilitate social change and biodiversity information management. Experts identified 50 priority information needs which emphasize the importance of (i) reviewing policies and actions and disseminating lessons learned from successes and failures; (ii) better understanding mechanisms to build public support; (iii) improving, in specific instances, understanding of the status and trends of habitats, species, ecosystems, and threats for planning and management; and (iv) mobilizing biodiversity information. Through the Convention on Biological Diversity, the global community has resolved to “live in harmony with nature”; through our Canadian case-study, we conclude that the most pressing need to address this resolution is an improved understanding of how to move from conservation knowledge to conservation action.

Dietz, S., **Beazley, K.F.**, Lemieux, C.J., St. Clair, C., Coristine, L., Higgs, E., Smith, R., Pellatt, M., Beaty, C., Cheskey, E., Cooke, S.J., Crawford, L., Davis, R., Forbes, G., Gadallah, F., Kendall, P., Mandrak, N., Moola, F., Parker, S., Quayle, J., Ray, J.C., Richardson, K., Smith, K., Snider, J., Smol, J.P., Sutherland, W.J., Vallillee, A., White, L., Woodley, A. (2021). Emerging issues for protected and conserved areas in Canada. *Facets*, 6, 1892-1921.

Horizon scanning is increasingly used in conservation to systematically explore emerging policy and management issues. We present the results of a horizon scan of issues likely to impact management of Canadian protected and conserved areas over the next 5–10 years. Eighty-eight individuals participated, representing a broad community of academics, government and nongovernment organizations, and foundations, including policymakers and managers of protected and conserved areas. This community initially identified 187 issues, which were subsequently triaged to 15 horizon issues by a group of 33 experts using a modified Delphi technique. Results were organized under four broad categories: (i) emerging effects of climate change in protected and conserved areas design, planning, and management (i.e., large-scale ecosystem changes, species translocation, fire regimes, ecological integrity, and snow patterns); (ii) Indigenous governance and knowledge systems (i.e., Indigenous governance and Indigenous knowledge and Western science); (iii) integrated conservation approaches across landscapes and seascapes (i.e., connectivity conservation, integrating ecosystem values and services, freshwater planning); and (iv) early responses to emerging cumulative, underestimated, and novel threats (i.e., management of cumulative impacts, declining insect biomass, increasing anthropogenic noise, synthetic biology). Overall, the scan identified several emerging issues that require immediate attention to effectively reduce threats, respond to opportunities, and enhance preparedness and capacity to react.

**Beazley, K.F.**, Olive, A. (2021). Transforming conservation in Canada: Shifting policies and paradigms. *Facets*, 6, 1714-1727.

The papers in the Collection address one or more of four broad themes:

1. Federalism: federal and provincial legislation dealing with biodiversity, conservation, wildlife, and species at risk in Canada, domestically and in relation to international agreements and commitments;
2. Institutional factors: political, legal, social, and institutional gaps and barriers to effective conservation;
3. Re-Indigenizing conservation: Indigenous governance, knowledge systems, rights, responsibilities, and Natural law in relation to upholding Treaties, reconciliation, and conservation (e.g., Indigenous Protected and Conserved Areas, Indigenous Guardian Programs, biocultural keystone species and stewardship); and

4. Holistic approaches: bridging ethics, science, and policy to create, incentivize, and mobilize better conservation practices in Canada.

Nokmaq, M.-I., Marshall, A., **Beazley, K.F.**, Hum, J., Joudry, S., Papadopoulos, A., **Pictou, S.**, Rabesca, J., Young, L., **Zurba, M.** (2021). "Awakening the sleeping giant": Re-Indigenization principles for transforming biodiversity conservation in Canada and beyond. *Facets*, 6 (1), 839-869.

Precipitous declines in biodiversity threaten planetary boundaries, requiring transformative changes to conservation. Colonial systems have decimated species and ecosystems and dispossessed Indigenous Peoples of their rights, territories, and livelihoods. Despite these challenges, Indigenous-governed lands retain a large proportion of biodiversity-rich landscapes. Indigenous Peoples have stewarded the land in ways that support people and nature in respectful relationship. Biodiversity conservation and resurgence of Indigenous autonomies are mutually compatible aims. To work towards these aims requires significant transformation in conservation and re-Indigenization. Key to both are systems that value people and nature in all their diversity and relationships. This paper introduces Indigenous principles for re-Indigenizing conservation: (i) embracing Indigenous worldviews of ecologies and M's-it No'kmaq, (ii) learning from Indigenous languages of the land, (iii) Natural laws and Netukulimk, (iv) correct relationships, (v) total reflection and truth, (vi) Etuaptmumk—"two-eyed seeing," and "strong like two people", and (vii) "story-telling/ story-listening". Although the principles derive primarily from a Mi'kmaw worldview, many are common to diverse Indigenous ways of knowing. Achieving the massive effort required for biodiversity conservation in Canada will entail transformations in worldviews and ways of thinking and bold, proactive actions, not solely as means but as ongoing imperatives.

Strain, H.S., **Beazley, K.F.**, **Walker, T.R.** (2021). Pharmaceuticals and personal care products and their sublethal and lethal effects in aquatic organisms. *Environmental Reviews*, 29 (2), 142-181.

Pharmaceuticals and personal care products (PPCPs) include over-the-counter and prescription drugs, veterinary drugs, fragrances, and cosmetics. PPCPs have been detected in aquatic environments at low concentrations and are emerging as contaminants of concern. PPCPs are primarily released into aquatic environments via untreated sewage, wastewater treatment plants, landfill leachate and can affect aquatic life through persistence, bioaccumulation, and toxicity. However, there are limited reviews of lethal and sublethal effects of PPCP exposures on aquatic organisms. To understand PPCP toxicity on aquatic organisms, a literature review was conducted that identified aquatic organisms known to be affected by PPCPs; concentrations of PPCPs reported as producing sublethal and lethal effects in aquatic organisms; and research gaps on PPCP aquatic toxicity. Twelve PPCPs were selected from three seminal studies for review, including bisphenol A, carbamazepine, erythromycin, fluoxetine, linear alkylbenzene sulfonate, metoprolol, naproxen, nonylphenol, ofloxacin, sertraline, sulfamethoxazole, and triclosan. Many aquatic species were affected by PPCPs at sublethal and lethal exposures, including sublethal effects at environmentally relevant concentrations. Because lethal effects were seldom observed at environmentally relevant concentrations, many studies considered PPCPs non-toxic. Few studies have compared effects of PPCPs on the same organisms for identical exposure parameters (time and concentration), resulting in wide variation in reported toxicity levels with limited consensus in the academic literature. Consensus in lethal concentrations was reported for *Daphnia magna* with 48 h exposure for bisphenol A and triclosan and *Vibrio fischeri* with 15 min exposure to carbamazepine. Environmentally relevant sublethal concentrations were higher than water quality guidelines developed for Canada and predicted no-effect concentrations derived globally. Species sensitivity distributions for some PPCPs show that aquatic species are affected lethally at environmentally relevant concentrations. More studies on indirect and long-term ecological effects along with testing chronic toxicity of PPCPs at

environmentally relevant concentrations are recommended. These will help guide future research to determine extent and magnitude of PPCP concentrations in aquatic environments and help inform management decisions to reduce sources of PPCPs into the environment. Future management requires effective monitoring strategies regarding use, disposal, occurrence, and impacts at different life cycle stages of PPCPs in the environment.

Sorensen Kass, J., **Duinker, P.N., Zurba, M., Smit, M.** (2021). Testing a novel human-nature connection model with Halifax's urban forest using a text-messaging engagement strategy. *Urban Forestry and Urban Greening*, 65, 127350.

Urban nature has the capacity to enrich the lives of those experiencing it, yet research shows that fewer and fewer humans feel this connection. While experiences with nature continue to decline, engagement with personal technology is on the rise. To engage people with urban trees, we sought to apply this technology in a new way. Text-A-Tree served as a two-month engagement project in which visitors to the Halifax Public Gardens (Nova Scotia, Canada) could send text messages to fifteen selected trees. Trees had unique personalities which were maintained by volunteers who wrote messages in response. Interactions were managed behind-the-scenes using Zendesk, a web-based customer-service platform. Between July 7 and August 31, 2019, a total of 10,643 messages were received from 2,888 unique phone numbers. While values such as beauty and shade were expressed, qualitative analysis revealed what participants most valued about the exchange was the opportunity to develop a relationship with trees. Participants conducted themselves politely, often asking about the trees' backstories, likes, interests, and wellbeing. Survey results showed that this sense of connection extended to trees beyond the gardens. Participants reported the greatest change in their connection to urban trees as stemming from the process of learning.

Thompson, K., **Duinker, P.N., Sherren, K.** (2021). Ecosystem services: A new framework for old ideas, or advancing environmental decision-making? Learning from Canadian forerunners to the ES concept. *Canadian Geographer*, 65 (3), 306-320.

Frameworks of ecosystem services (ES) are promoted as a new and important way to recognize, understand, and account for nature's benefits. We questioned assertions of the novelty of ES ideas and conducted a comparative analysis of approaches in planning, landscape architecture, and sustainable forest management against the Millennium Ecosystem Assessment ES framework. We conclude that the newer Millennium Ecosystem Assessment ES framing may assist planners in connecting local land-use change to human well-being, assessing trade-offs, and accounting for future uncertainty. Analogous approaches such as sustainable forest management offer practical insights, for example, about gauging, guiding, and reporting on sustainable use of ecosystems. We encourage environmental planners to engage with ES researchers to develop the approach and advance planning practice.

Keys, K., Burton, D.L., Price, G.W., **Duinker, P.N.** (2021). Ion availabilities in two forest soils amended with alkaline-treated biosolids, agricultural lime, and wood fly ash over a 10-week period. *Canadian Journal of Forest Research*, 51 (1), pp. 41-48.

Two forest soil B-horizons were amended with alkaline-treated biosolids (ATB), powdered agricultural lime, and wood fly ash under controlled conditions to compare initial ion availabilities over a 10-week period. ATB was most effective in supplying available Ca<sup>2+</sup> but least effective in supplying available Mg<sup>2+</sup>, for which lime was most effective. Availability of K<sup>+</sup> and SO<sub>4</sub><sup>2-</sup>-S was greatest in fly ash amended soils because of high K and S loading rates and the high electrical conductivity of this amendment.

Mineral N ( $\text{NO}_3\text{---N} + \text{NH}_4\text{---N}$ ) availability increased in ATB amended soils, stayed the same in lime amended soils, and decreased in fly ash amended soils. Availability of  $\text{PO}_4\text{---P}$  was low in all soils but slightly enhanced in ATB amended soils. Fluxes of  $\text{Cu}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Zn}^{2+}$ , and  $\text{Mn}^{2+}$  in amended soils generally decreased over time in association with increased soil pH. Fluxes of  $\text{Cd}^{2+}$  were not affected by any treatment. Results suggest that ATB is equally as effective as or more effective than lime and fly ash at immediately supplying  $\text{Ca}^{2+}$ , but less effective at supplying  $\text{Mg}^{2+}$  because of low inputs and cation competition. This suggests that ATB amendments could be an alternative means of quickly adding available  $\text{Ca}^{2+}$  to Ca-depleted forest soils as long as potential impacts on other nutrient base cations are considered.

Viehberg, F.A., Medeiros, A.S., Plessen, B., Wang, X., Muir, D., Pienitz, R. (2021). The influence of a lost society, the Sadlermiut, on the environment in the Canadian Arctic. *Scientific Reports*, 11 (1), 18504.

High latitude freshwater ecosystems are sentinels of human activity and environmental change. The lakes and ponds that characterize Arctic landscapes have a low resilience to buffer variability in climate, especially with increasing global anthropogenic stressors in recent decades. Here, we show that a small freshwater pond in proximity to the archaeological site “Native Point” on Southampton Island (Nunavut, Arctic Canada) is a highly sensitive environmental recorder. The sediment analyses allowed for pinpointing the first arrival of Sadlermiut culture at Native Point to ~ 1250 CE, followed by a dietary shift likely in response to the onset of cooling in the region ~ 1400 CE. The influence of the Sadlermiut on the environment persisted long after the last of their population perished in 1903. Presently, the pond remains a distorted ecosystem that has experienced fundamental shifts in the benthic invertebrate assemblages and accumulated anthropogenic metals in the sediment. Our multi-proxy paleolimnological investigation using geochemical and biological indicators emphasizes that direct and indirect anthropogenic impacts have long-term environmental implications on high latitude ecosystems.

Medeiros, A.S., Williams, A., Milošević, D. (2021). Assessment of ecological impairment of Arctic streams: Challenges and future directions. *Ecology and Evolution*, 11 (14), 9715-9727.

As increased growth and development put pressure on freshwater systems in Arctic environments, there is a need to maintain a meaningful and feasible framework for monitoring water quality. A useful tool for monitoring the ecological health of aquatic systems is by means of the analysis and inferences made from benthic invertebrates in a biomonitoring approach. Biomonitoring of rivers and streams within the Arctic has been under-represented in research efforts. Here, we investigate an approach for monitoring biological impairment in Arctic streams from anthropogenic land use at two streams with different exposure to urban development in Iqaluit, Nunavut, Arctic Canada. Sites upstream of development, at midpoint locations, and at the mouth of each waterbody were sampled during 6 campaigns (2008, 2009, 2014, 2015, 2018, and 2019) to address spatial and temporal variability of the macroinvertebrate community. The influence of taxonomic resolution scaling was also examined in order to understand the sensitivity of macroinvertebrates as indicators in Arctic aquatic systems. We demonstrate that standard biological metrics were effective in indicating biological impairment downstream of sources of point-source pollutants. A mixed-design ANOVA for repeated measures also found strong interannual variability; however, we did not detect intra-annual variation from seasonal factors. When examining metrics at the highest taxonomic resolution possible, the sensitivity of metrics increased. Likewise, when trait-based metrics ( $\alpha$  functional diversity) were applied to indicators identified at high taxonomic resolution, a significant difference was found between reference and impacted sites. Our results show that even though Arctic systems have lower diversity and constrained life-history characteristics compared to temperate ecosystems, biomonitoring is not only possible, but

also equally effective in detecting trends from anthropogenic activities. Thus, biomonitoring approaches in Arctic environments are likely a useful means for providing rapid and cost-effective means of assessing future environmental impact.

Cincio, P., **Medeiros, A.S.**, Wesche, S.D., Gajewski, K. (2021). Quantifying the vulnerability of Arctic water supply lakes through paleolimnological assessment: The case of Igloodik, Nunavut, Canada. *Holocene*, 31 (7), 1175-1185.

Anthropogenic stressors to freshwater environments have perpetuated water quality and quantity challenges for communities across Arctic Canada, making drinking water resources a primary concern for northern peoples. To understand the ecological trajectory of lakes used as freshwater supply, we conducted a paleolimnological assessment on two supplemental sources in Igloodik, Nunavut, Arctic Canada. A stratigraphic examination of biological indicators (Insecta: Diptera: Chironomidae) allowed for paleotemperature reconstructions with decadal and centennial resolution over the past 2000 years. Between 200 and 1900 CE, the sub-fossil chironomid community was comprised of cold-water taxa, such as *Abiskomyia*, *Micropsectra radialis*-type, and *Paracladius*. Reconstructed temperatures were consistent with known climate anomalies during this period. A rapid shift in the composition of the chironomid assemblages to those with higher temperature optima (*Chironomus anthracinus*-type, *Dicretodipes*, and *Tanytarsus lugens*-type) in the late 20th century was observed in both systems. Our results demonstrate that these ecosystems are undergoing marked transformations to warmer, more nutrient-rich environments, and suggest that water sustainability pressures will likely continue in tandem with ongoing climate change. To contextualize the influence of recent warming and elucidate the status of freshwater resources over the longer term, paleolimnological methods can be usefully applied as components of vulnerability assessments.

Luszczek, C.E., **Medeiros, A.S.**, Wolfe, B.B., Quinlan, R. (2021). Effects of recent climate and environmental changes on the ecology of a boreal forest lake in Manitoba, Canada. *Journal of Paleolimnology*, 66 (1), 15-27.

Application of paleoenvironmental approaches provides insight into the magnitude and timing of responses to climate warming in aquatic-ecosystems of northern Canada. We examined subfossil biological (Diptera:Chironomidae) and geochemical indicators (organic carbon and elemental nitrogen and stable isotope composition) in a sediment core from Buckland Lake, northern Manitoba, to assess the influence of recent warming (1981–2011) in the central subarctic region of Canada. The earlier part of the paleolimnological record (1830–1980) was characterized by relatively low chironomid diversity ( $N_2 \sim 6$ ), consisting primarily of profundal taxa (*Orthocladius consobrinus* and *Chironomus*), low organic matter content of sediments (<12%), low C:N ratios (<9), and high  $\delta^{15}\text{N}$  values > 3‰, indicative of a cold-water environment with low nitrogen demand. Between 1910 and 1980, there was a decline in profundal taxa, with small gradual increases in littoral taxa, such as *Cladotanytarsus mancus*-group. Post-1980 sediment core intervals had distinct geochemistry, with declines in  $\delta^{13}\text{C}_{\text{org}}$  from  $-27.5\text{‰}$  to almost  $-29\text{‰}$ , consistent with warming, increased terrestrial influence, and increased snowfall and runoff. We found substantial inferred warming ( $+1\text{--}2^\circ\text{C}$ ), with several chironomid-inferred temperatures nearly  $3^\circ\text{C}$  warmer than typical pre-1980 inferences. Concurrently, several warm-water-adapted littoral chironomid taxa (*Cladopelma*, *Cryptochironomus*, *Polypedilum*) recorded increases. The post-1990 records reflected continued increases in warm-water taxa, changes in the benthic:pelagic trophic structure, and reversal of previous trends in the  $\delta^{13}\text{C}_{\text{org}}$ , %Organic Carbon, and  $\delta^{15}\text{N}$  profiles, suggestive of increased aquatic productivity. The meteorological station at Gillam, Manitoba, also recorded warming ( $1.5^\circ\text{C}$ ) and a reduction in snowfall during that time period. A reduction in spring recharge may

have increased littoral habitat associated with lake-level drawdown. The climate-driven shift observed ~1980 is in generally good agreement with other regional analyses, which show regime shifts occurred ~1995. The earlier lake response (~1980), however, demonstrates the role of increased catchment-mediated influences on northern boreal lake productivity that may only appear in records with sufficiently high resolution and multiple paleolimnological indicators.

Watson, V.T., **Medeiros, A.S.** (2021). The value of paleolimnology in reconstructing and managing ecosystem vulnerability: a systematic map. *Facets*, 6 (1), 517-536.

Vulnerability can measure an ecosystem's susceptibility to change as a result of pressure or disturbance, but can be difficult to quantify. Reconstructions of past climate using paleolimnological methods can create a baseline to calibrate future projections of vulnerability, which can improve ecosystem management and conservation plans. Here, we conduct a systematic map to analyze the range and extent that paleolimnological published studies incorporated the concept of vulnerability. Additional themes of monitoring, management, conservation, restoration, or ecological integrity were also included. A total of 52 relevant unique articles were found, a majority of which were conducted in Europe or North America since 2011. Common themes identified included management and adaptation, with the latter heavily focussed on climate change or disturbance. From this, we can infer that the use of paleolimnology to discuss the concept of vulnerability is an emerging field. We argue that paleolimnology plays a valid role in the reconstruction of ecosystem vulnerability due to its capacity to broaden the scope of long-term monitoring, as well as its potential to help establish management and restoration plans. The use of paleolimnology in vulnerability analysis will provide a clearer lens of changes over time; therefore, it should be frequently implemented as a tool for vulnerability assessment.

**Medeiros, A.S.**, Milošević, Đ., Francis, D.R., Maddison, E., Woodroffe, S., Long, A., Walker, I.R., Hamerlík, L., Quinlan, R., Langdon, P., Brodersen, K.P., Axford, Y. (2021). Arctic chironomids of the northwest North Atlantic reflect environmental and biogeographic gradients. *Journal of Biogeography*, 48 (3), 511-525.

**Aim:** While we understand broad climate drivers of insect distributions throughout the Arctic, less is known about the role of spatial processes in determining these relationships. As such, there is a need to understand how spatial controls may influence our interpretations of chironomid environment relationships. Here, we evaluated whether the distribution of chironomids followed spatial gradients, or were primarily controlled by environmental factors. **Location:** Eastern Canadian Arctic, Greenland, Iceland. **Taxon:** Non-biting midges (Chironomidae). **Methods:** We examined chironomid assemblages from 239 lakes in the western North Atlantic Arctic region (specifically from the Arctic Archipelago of Canada, two parts of west Greenland (the southwest and central west) and northwest Iceland). We used a combination of unconstrained ordination (Self Organizing Maps); a simple method with only one data matrix (community data), and constrained ordination (Redundancy Analysis); a canonical ordination with two datasets where we extracted structure of community related to environmental data. These methods allowed us to model chironomid assemblages across a large bioregional dimension and identify specific differences between regions that were defined by common taxa represented across all regions in high frequencies, as well as rare taxa distinctive to each region found in low frequencies. We then evaluated the relative importance of spatial processes versus local environmental factors. **Results:** We find that environmental controls explained the largest amount of variation in chironomid assemblages within each region, and that spatial controls are only significant when crossing between regions. Broad-scale biogeographic effects on chironomid distributions are reflected by the distinct differences among chironomid assemblages of Iceland, central-west Greenland, and eastern Canada, defined by the presence of certain common and low-frequency, rare taxa for each region. Environmental gradients,

especially temperature, defined species distributions within each region, whereas spatial processes combine with environmental gradients in determining what mix of species characterizes each broad and geographically distinct island region in our study. Main conclusions: While biogeographic context is important for defining interpretations of environmental controls on species distributions, the primary control on distributions within regions is environmental. These influences are fundamentally important for reconstructing past environmental change and better understanding historical distributions of these insect indicators.

Covert, A.E., **Medeiros, A.S.** (2021). Reconstructing the “push” and “pull” of climate and its impacts on subsistence cultures using paleolimnology. *Facets*, 6, 2042-2056.

Climate variability has influenced settlement and cultural activities of human populations for millennia, and our knowledge of the context of environmental drivers of migration can be inferred using paleolimnological techniques. We present a systematic map of literature to understand the breadth of paleolimnological research that exists on environmental change and its impact on subsistence cultures. We aim to illustrate how the “push” and “pull” of climate influenced human society over the late-Holocene. A systematic search found 68 unique relevant studies that discussed topics of human settlement and migration, stressors on the environment, and (or) ecological monitoring with respect to changes in climate using paleolimnological methods. We identified three primary themes: where people live, how people live, and how people will continue to live. Most studies took place in North America, within the last decade, and had a focus on diatoms, sediment characteristics, and climate. Topics ranged from reconstructions of changes in climate, human presence, human influence on the environment, subsistence strategies, and the importance of monitoring. We demonstrate the value of paleolimnological methods in understanding the timing of events, revealing long-term ecological trends, and providing baseline conditions for effective remediation and management purposes.

Niemeyer, A.M., **Medeiros, A.S.**, Todd, A., Wolfe, B.B. (2021). Identifying the influence of terrestrial–aquatic connectivity on palaeoecological inferences of past climate in Arctic lakes. *Boreas*.

Increased hydrological connectivity due to permafrost degradation is likely to have substantial implications for shallow aquatic systems common to sub-arctic landscapes due to changes to overland and subsurface flow of water and transport of sediments and dissolved nutrients. Here, we explore the influence of increased connectivity on aquatic productivity based on multi-parameter palaeolimnological analysis of two lakes located near Inuvik (Northwest Territories, Canada). We contrast a lake with little evidence of permafrost degradation in the surrounding area (Lake PG03) to one that has multiple connections to the terrestrial landscape through a network of thaw polygons in the lake catchment (Lake PG09). Comparisons of biological indicators (chironomids) and organic carbon and nitrogen elemental and isotope composition reveal recent divergent lake histories. The chironomid assemblage of Lake PG03 followed an expected temperature gradient, with a warming signal evident since ~1970 CE, whereas the chironomid assemblage of Lake PG09 was found to primarily respond to nutrient availability and changes in habitat, likely as a result of increasing hydrological connectivity to the landscape. Rapid assemblage and habitat change along with a prominent increase in chironomid abundance were observed at Lake PG09 after ~1960 CE, following a shift to greater inputs from the terrestrial environment as indicated by high C:N ratios >15) and low  $\delta^{13}\text{C}_{\text{org}}$  (–30‰). Increased aquatic productivity following high allochthonous additions (~1960–2014 CE) is supported by decreased C:N and rapidly increasing organic matter ( $\text{C}_{\text{org}}$ , N). These results demonstrate that increased connectivity along the terrestrial–aquatic interface for lakes is likely to foster elevated productivity in the future. Likewise, increased production poses a challenge to chironomid-inferred July air temperature reconstructions in



lakes that are less resilient to secondary gradients, where analogue mismatches can occur due to shifts in dominance of indicators that are orthogonal to the temperature gradient.

Pimentel da Silva, G.D., **Sherren, K.**, Parkins, J.R. (2021). Using news coverage and community-based impact assessments to understand and track social effects using the perspectives of affected people and decisionmakers. *Journal of Environmental Management*, 298, 113467.

This paper applies an innovative approach to monitoring social effects occurring before and during construction of two hydroelectric dams in Canada. The two studied dams, Site C and Keeyask, are under construction in Canada and underwent community-based impact assessment (CBIA). News coverage and the CBIA documents were analyzed to understand and compare how those two groups perceive social effects induced by the two projects. CBIAs contain concerns expressed by affected people, whereas news coverage can include quotes from both affected people and decisionmakers involved in the assessment process. By contrasting these datasets, we found that the documents are complementary: while CBIAs are comprehensive in assessing community concerns, news outlets can reveal how those concerns evolved throughout different phases of the projects' implementation. This approach fills a gap in SIA around monitoring of key social effects around local conflicts and disputes, psychosocial effects, socioeconomic effects, and cumulative effects on a daily life. Furthermore, by contrasting the views identified within the impact assessments and the media, the study demonstrates how specific concerns diverged: affected people focus on local social effects while decisionmakers' interests lie in a broader political perspective grounded in local sacrifices 'for the good of the whole province'. Our analysis emphasizes the role of political power over decision making that can inhibit CBIA and social impact assessment practice from contributing to socially sustainable projects.

Pimentel da Silva, G.D., Parkins, J.R., **Sherren, K.** (2021). Do methods used in social impact assessment adequately capture impacts? An exploration of the research-practice gap using hydroelectricity in Canada. *Energy Research and Social Science*, 79, 102188.

Reviewing social impact assessment (SIA) documents is important to understand whether SIA methods and the range of issues covered have evolved as a response to legislation changes and best practices. A national study can help researchers to understand the practice of SIA under comparable regulatory requirements. This study used available hydroelectric SIA reports in Canada (n = 37) to investigate SIA methods, and what impacts they tend to anticipate. First, compared with the scholarly literature, the study found that time (as a proxy for evolution in knowledge and legislation change) was only weakly correlated with the quality of reports. Usually, the size of projects had a greater influence on the range of social impact topics addressed within the reports. Secondly, we demonstrate that methods used to construct the reports are often poorly described. In addition, our comparison with the literature shows that SIA professional practice has not kept pace with scholarly literature that recommends incorporating more engagement components. The existence of a few community-led assessments, participatory map-based approaches, and some efforts to engage with communities outside open houses were considered positive changes. Nonetheless, baseline assessments and anticipations of social impacts remain focused on the implications of population growth, physical infrastructure, and socioeconomics with minimal consideration for the livelihoods, culture, and wellbeing of host communities. The study also identified possible root causes for the lack of innovation and narrow economic scope. Finally, we provide practical recommendations to improve SIA methods used to anticipate social impacts.

Bennett, E.M., Morrison, P., Holzer, J.M., Winkler, K.J., Fraser, E.D.G., Green, S.J., Robinson, B.E., **Sherren, K.**, Botzas-Coluni, J., Palen, W. (2021). Facing the challenges of using place-based social-ecological research to support ecosystem service governance at multiple scales. *Ecosystems and People*, 17 (1), 574-589.

Place-based social-ecological research is often designed to improve local environmental governance, but it can also inform decisions at larger scales or in other places. However, the focus on local perspectives in such research creates challenges for transferring insights to other locations, and for aggregating understanding to larger scales. In this paper, we discuss how ResNet, a new pan-Canadian network of researchers working on place-based social-ecological case studies via ecosystem services, will face (and hopefully overcome) these challenges while taking advantage of the unique benefits of a place-based approach. Drawing on insights from the literature and from the first 10 years of the Programme for Ecosystem Change and Society (PECS), we outline solutions to six key challenges to multi-scale knowledge integration across place-based cases, and explore how ResNet is employing some of these solutions.

**Sherren, K.**, Ellis, K., Guimond, J.A., Kurylyk, B., LeRoux, N., Lundholm, J., Mallory, M.L., Van Proosdij, D., Walker, A.K., Bowron, T.M., Brazner, J., Kellman, L., Turner, B.L., II, Wellsa, E. (2021). Understanding multifunctional bay of Fundy dykelands and tidal wetlands using ecosystem services—a baseline. *Facets*, 6, 1446-1473.

We review what is known about ecosystem service (ES) delivery from agricultural dykelands and tidal wetlands around the dynamic Bay of Fundy in the face of climate change and sea-level rise, at the outset of the national NSERC ResNet project. Agricultural dykelands are areas of drained tidal wetland that have been converted to agricultural lands and protected using dykes and aboiteaux (one-way drains or sluices), first introduced by early French settlers (Acadians). Today, Nova Scotia's 242 km system of dykes protect 17,364 ha of increasingly diverse land uses-including residential, industrial, and commercial uses as well as significant tourism, recreational, and cultural amenities-and is undergoing system modernization and adaptation. Different ES are provided by drained and undrained landscapes such as agriculture from dykelands and regulating services from wetlands, but more complex dynamics exist when beneficiaries are differentiated. This review reveals many knowledge gaps about ES delivery and dynamics, including around net greenhouse gas implications, storm protection, water quality, fish stocks, pollination processes, sense of place, and aesthetics, some of which may reveal shared ES or synergies instead of trade-offs. We emphasize the need to be open to adapting ES concepts and categorizations to fully understand Indigenous implications of these land use decisions.

Chen, Y., **Sherren, K.**, Smit, M., Lee, K.Y. (2021). Using social media images as data in social science research. *New Media & Society*.

We conducted a scoping review to identify and describe trends in the use of social media images as data sources to inform social science research in published articles from 2015 to 2019. The identified trends include the following: (1) there is increasing interest in social media images as research data, especially in disciplines like sociology, cultural studies, communication and environmental studies; (2) the photo sample size is often smaller than that is typically used in text-based social media analysis and usually is collected manually; (3) thematic coding, object recognition and narrative analysis are the most popular analysis methods that are often conducted manually; (4) computer vision and machine-learning technologies have been increasingly but still infrequently used and are not fit for all purposes; and (5)

relatively few papers mention ethics and privacy issues, or apply strategies to address ethical issues. We identify noteworthy research gaps, and opportunities to address limitations and challenges.

Rahman, H.M.T., Bowron, T., Pett, B., **Sherren, K.**, Wilson, A., van Proosdij, D. (2021). Navigating nature-based coastal adaptation through barriers: A synthesis of practitioners' narrative from Nova Scotia, Canada. *Society and Natural Resources*, 34 (9), 1268-1285.

Nature based coastal adaptation (NbCA) sustainably helps minimize sea-level rise impacts, using and enhancing the natural capacity of coastal ecosystems. Despite its relative advantages over conventional hard protection infrastructure, the implementation of NbCA is challenged by diverse barriers, many of which cannot be overcome in the absence of appropriate policy directives. This paper draws on organizational practitioners' case study narratives collected from six NbCA projects planned and/or implemented in Nova Scotia, Canada, to answer how the implementation of NbCA approaches can be navigated through adoption barriers. Results reveal that institutional and psychological barriers dominate, and they also show path-dependency. In addition, barriers are often influenced by the biophysical properties of a restoration site. To navigate through barriers, it is important to identify policy opportunities and redistribute roles and responsibilities. Organizational knowledge creation through partnership and community engagement are two other strategies required for the successful implementation of NbCA.

Chappell, E.N., Parkins, J.R., **Sherren, K.** (2021). Those who support wind development in view of their home take responsibility for their energy use and that of others: evidence from a multi-scale analysis. *Journal of Environmental Policy and Planning*, 23 (4), 510-527.

While shifting electricity production to renewable sources is of critical importance in addressing global climate change, the costs of such development are often felt locally. This study explores what leads to support for wind development when respondents are asked to think about three different geographic scales: general, regional and within view of their home. Research was conducted in the Chignecto area of Atlantic Canada, a semi-rural area in which a prominent 15-turbine wind farm was constructed in 2012. A random population mail-out survey achieved a response rate of 40%. Questions explored exposure to wind turbines; support for wind energy development; place attachment; beliefs concerning the distribution of energy and benefits; and demographics. While most predictors of support are significant in bivariate correlations, many commonly used predictors of wind support, such as place attachment or community benefits, disappear or weaken under controls as predictors of support at smaller scales. Novel predictors of support inspired by climax thinking emerged as stronger at more local scales, including support for energy export beyond local needs and agreement that wind turbines provide a reminder of energy use. These results suggest new pathways for understanding support for wind development within the communities most directly affected.

Tourangeau, W., **Sherren, K.** (2021). Why is grazing management being overlooked in climate adaptation policy? *Agroecology and Sustainable Food Systems*, 45 (6), 843-867.

In 2018, two studies were conducted by Canada's Parliament on the connections between climate change and agriculture. Links between grazing management and climate change adaptation and mitigation are included in the testimonies gathered during these studies but the resulting final reports are silent on the topic. Analysis of 112 parliamentary files revealed insights on (1) the knowledge about grazing management that was omitted from the two final reports, (2) the social contexts that informed the processes of hearing testimonies and developing the reports, and (3) the underlying ideologies and

normative assumptions reflected in these studies. Overall, the current state of policy regarding climate change and agriculture emphasizes technical, scientific, and expensive solutions, and as a result, the benefits of grazing management are overlooked. We argue transformations toward sustainable, climate adaptive agriculture require an ongoing examination of how political structures, knowledge hierarchies, and underlying ideologies inform and narrow policy outcomes.

Bennett, E.M., Baird, J., Baulch, H., Chaplin-Kramer, R., Fraser, E., Loring, P., Morrison, P., Parrott, L., **Sherren, K.**, Winkler, K.J., Cimon-Morin, J., Fortin, M.-J., Kurylyk, B.L., Lundholm, J., Poulin, M., Rieb, J.T., Gonzalez, A., Hickey, G.M., Humphries, M., Bahadur KC, K., Lapen, D. (2021). Ecosystem services and the resilience of agricultural landscapes. *Advances in Ecological Research*, 64, 1-43.

Global social and economic changes, alongside climate change, are affecting the operating environment for agriculture, leading to efforts to increase production and yields, typically through the use of agrochemicals like pesticides and fertilizers, expanded irrigation, and changes in seed varieties. Intensification, alongside the expansion of agriculture into new areas, has increased harvest, but has also had numerous well-known impacts on the environment, ultimately resulting in a loss of resilience and lack of sustainability in agro-ecosystems. Combined with features of agricultural systems such as the differential movement of ecosystem services, and interactions among ecosystem services driven in part by management choices, such intensification has disrupted key feedbacks in agricultural systems. These changes have tended to perpetuate the management choices that have led to efficient, productive agriculture, often at the expense of nature and the provision of important nonfood ecosystem services. Here, we explore how agriculture functions as a complex adaptive system. We assess how recent changes have interacted with agro-ecosystem features to result in a loss of resilience, and suggest key research directions to help harmonize production and ecosystem function, drawing primarily on Canadian examples. Enhancing the resilience of agricultural landscapes is critical to the long-term sustainability of agriculture in a rapidly changing world.

Tourangeau, W., Lamarque, M., Greenland-Smith, S., **Sherren, K.** (2021). Beyond intrinsic: a call to combine scales on motivation and environmental values in wildlife and farmland conservation research. *Human Dimensions of Wildlife*, 26 (4), 375-389.

It has become common to explore farmer motivations for adopting land management changes on a scale from intrinsic to extrinsic, including in studies on “motivation crowding” that examine how external incentives can undermine or reinforce a farmer’s intrinsic reasons for protecting nature. We set out to do the same in a study on riparian management for the conservation of a species at risk in Nova Scotia, Canada. In our survey of 553 farmers in Nova Scotia, we received surprising results: similar agreement with statements on motivations to use riparian setbacks when wildlife is mentioned. All these statements corresponded to internal motivations found at the intrinsic end of the scale used. We postulate that environmental values associated with ‘wildlife’ triggered the positive responses. Environmental values influence farmer motivations toward conservation. We propose future studies on farmer motivations for adopting land management changes combine a scale on motivations with a scale on environmental values.

Dahl, K.M., Bork, E.W., Parkins, J.R., **Sherren, K.** (2021). Assessing variation in range health across grazed northern temperate grasslands. *Rangeland Ecology and Management*, 74, 135-146.

Contemporary methods of rangeland health (RH) assessment evaluate indicators designed to assess land use impacts on ecosystem function. These methods have not been tested relative to variation in specific

grazing practices, including grazing period length and stocking rates during the growing season. We report on RH outcomes for three habitat types (native grassland, tame pasture, and forested pasture) across 97 pastures on 28 beef cattle ranches in Alberta, Canada. Pastures were distributed along a climatic gradient encompassing the grassland, parkland/foothill, and boreal regions. Surveys of ranchers were used to quantify typical grazing period length (1 May–31 October) and, if applicable, rotation length, along with corresponding stocking rates for each pasture over the previous 5 yr. Pastures were assessed for RH using indicators of vegetation composition and structure, litter abundance, soil stability, weed presence, and within tame pastures, woody plant encroachment. An Akaike Information Criterion analysis compared the influence of aridity, grazing period length, and stocking rate on total range health scores (RHS) and ordination used to identify associations between indicator scores and grazing metrics. Total RHS varied among habitat types, being greater in forests than native and tame grasslands ( $P < 0.05$ ), and declined with increasing forage utilization, particularly in forests. Within tame pastures, total RHS varied primarily in response to regional climate, with RHS decreasing as moisture deficits increased and declining with longer grazing periods during summer. Native grasslands also decreased in RHS in response to longer grazing periods, with stocking rates having little impact on RHS. Select RH indicators were associated with improved health in native grasslands grazed for shorter periods including low weed abundance and greater litter. Further studies are recommended to understand how, over and above climatic influences, variation in grazing practices alter the health of northern temperate grasslands.

[Tonning, K.A., Budge, S.M., Tyedmers, P. \(2021\). Overwinter changes in the lipid profile of young-of-the-year striped bass \(\*Morone saxatilis\*\) in freshwater ponds. \*Biomolecules\*, 11 \(11\), 678.](#)

Young-of-the-year (YOY) striped bass (*Morone saxatilis*) suffer significant mortality during their first winter. While causes of this mortality are unclear, lipids may play a role in adapting to winter stresses, including thermal change and food scarcity. To address this, YOY striped bass were placed in mesh cages in freshwater ponds in the fall (November) and were held until the end of winter, in March. Liver and white muscle tissue were sampled at the beginning and end of the study to compare concentrations of specific lipid classes and fatty acid composition. Muscle-tissue total lipid and triacylglycerol (TAG) was higher in March (late winter) samples. Additionally, concentrations of phosphatidylethanolamine (PE) were higher in the white muscle of striped bass sampled in March; this was accompanied by a decrease in proportions of 18:0 and 22:6n-3 in PE (from ~11 to 7% and 36 to 28%, respectively) and 18:1n-9 and 22:6n-3 in phosphatidylcholine (from ~15 to 10% and 24 to 18%, respectively). This suggests that these fish were not utilizing energy reserves in previously described ways and appear to rely more on other lipid classes or body tissues for overwinter survival than those analyzed in this study.

[Gephart, J.A., Henriksson, P.J.G., Parker, R.W.R., Shepon, A., Gorospe, K.D., Bergman, K., Eshel, G., Golden, C.D., Halpern, B.S., Hornborg, S., Jonell, M., Metian, M., Mifflin, K., Newton, R., Tyedmers, P., Zhang, W., Ziegler, F., Troell, M. \(2021\). Environmental performance of blue foods. \*Nature\*, 597 \(7876\), 360-365.](#)

Fish and other aquatic foods (blue foods) present an opportunity for more sustainable diets. Yet comprehensive comparison has been limited due to sparse inclusion of blue foods in environmental impact studies relative to the vast diversity of production. Here we provide standardized estimates of greenhouse gas, nitrogen, phosphorus, freshwater and land stressors for species groups covering nearly three quarters of global production. We find that across all blue foods, farmed bivalves and seaweeds generate the lowest stressors. Capture fisheries predominantly generate greenhouse gas emissions, with small pelagic fishes generating lower emissions than all fed aquaculture, but flatfish and

crustaceans generating the highest. Among farmed finfish and crustaceans, silver and bighead carps have the lowest greenhouse gas, nitrogen and phosphorus emissions, but highest water use, while farmed salmon and trout use the least land and water. Finally, we model intervention scenarios and find improving feed conversion ratios reduces stressors across all fed groups, increasing fish yield reduces land and water use by up to half, and optimizing gears reduces capture fishery emissions by more than half for some groups. Collectively, our analysis identifies high-performing blue foods, highlights opportunities to improve environmental performance, advances data-poor environmental assessments, and informs sustainable diets.

[Drew, J., Christie, S.D., Tyedmers, P., Smith-Forrester, J., Rainham, D. \(2021\). Operating in a climate crisis: A state-of-the-science review of life cycle assessment within surgical and anesthetic care. \*Environmental Health Perspectives\*, 129 \(7\), 076001.](#)

**BACKGROUND:** Both human health and the health systems we depend on are increasingly threatened by a range of environmental crises, including climate change. Paradoxically, health care provision is a significant driver of environmental pollution, with surgical and anesthetic services among the most resource-intensive components of the health system. **OBJECTIVES:** This analysis aimed to summarize the state of life cycle assessment (LCA) practice as applied to surgical and anesthetic care via review of extant literature assessing environmental impacts of related services, procedures, equipment, and pharmaceuticals. **METHODS:** A state-of-the-science review was undertaken following a registered protocol and a standardized, LCA-specific reporting framework. Three bibliographic databases (Scopus®, PubMed, and Embase®) and the gray literature were searched. Inclusion criteria were applied, eligible entries critically appraised, and key methodological data and results extracted. **RESULTS:** From 1,316 identified records, 44 studies were eligible for inclusion. The annual climate impact of operating surgical suites ranged between 3,200,000 and 5,200,000 kg CO<sub>2</sub>e. The climate impact of individual surgical procedures varied considerably, with estimates ranging from 6 to 1,007 kg CO<sub>2</sub>e. Anesthetic gases, single-use equipment and heating, ventilation and air conditioning system operation were the main emissions hot spots identified among operating room-and procedure-specific analyses. Single-use equipment used in surgical settings was generally more harmful than equivalent reusable items across a range of environmental parameters. Life cycle inventories have been assembled and associated climate impacts calculated for three anesthetic gases (2–85 kg CO<sub>2</sub>e=MAC-h) and 20 injectable anesthetic drugs (0:01–3:0 kg CO<sub>2</sub>e/gAPI). **DISCUSSION:** Despite the recent proliferation of surgical and anesthesiology-related LCAs, extant studies address a miniscule fraction of the numerous services, procedures, and products available today. Methodological heterogeneity, external validity, and a lack of background life cycle inventory data related to many essential surgical and anesthetic inputs are key limitations of the current evidence base. This review provides an indication of the spectrum of environmental impacts associated with surgical and anesthetic care at various scales.

[Liu, Z., Liu, W., Walker, T.R., Adams, M., Zhao, J. \(2021\). How does the global plastic waste trade contribute to environmental benefits: Implication for reductions of greenhouse gas emissions? \*Journal of Environmental Management\*, 287, 112283.](#)

Plastic waste pollution has been identified as a serious global issue, posing environmental risks in terms of massive waste generation, ocean pollution, and increases in greenhouse gas (GHG) emissions. Despite documented environmental impacts, it remains debatable whether the global plastic waste trade (GPWT) for reutilization and recycling, as part of the global circular economy (CE), has historically contributed to environmental benefits. To investigate if historical GPWT has contributed to environmental benefits in terms of reductions of GHG emissions, this study analyzed GPWT between

China and trading countries through their trajectories, characteristics and driving forces of reductions of GHG emissions between 1992 and 2017. Results indicated an increasing trend of reductions of GHG emissions in GPWT between China and trading countries over 25 years. A net reduction of 8.27 million metric tons carbon dioxide equivalent (CO<sub>2</sub>e) was observed in 2012, nearly 84 times levels observed in 1992. Policy implications after China's recent ban of imports of GPWT in December 2017 and recent changes of GPWT to other Asian countries are discussed. Dramatic changes in sustainable approaches to GPWT for reutilization and recycling are required.

[Dionne, J., Walker, T.R. \(2021\). Air pollution impacts from a pulp and paper mill facility located in adjacent communities, Edmundston, New Brunswick, Canada and Madawaska, Maine, United States. \*Environmental Challenges\*, 5, 100245.](#)

Pulp and paper mills are known large emitters of air pollution, creating potential environmental challenges and human health impacts. This study assesses air pollution and associated impacts from connected pulp and paper facilities which operate in Edmundston, New Brunswick, Canada, and Madawaska, Maine, United States (US). Despite operating within two regulatory jurisdictions on both sides of the international border (in Canada and the US), the mills have exceeded their approvals to operate and national air quality regulations multiple times between 2010 and 2017. Previous studies have linked many types of cancer as well as respiratory and cardiovascular diseases to air pollution emitted by pulp and paper mills, making this an important regional issue in Canada and the US. While potential environmental and community impacts are likely similar on both sides of the international border, emissions from each side are not reported on the other, and few studies have been conducted on either side. Historic and ongoing lack of local epidemiological health and environmental impact studies and recommendations for improvements to mill operations to improve environmental and human health are presented.

[Walker, T.R., McGuinty, E., Hickman, D. \(2021\). Marine debris database development using international best practices: A case study in Vietnam. \*Marine Pollution Bulletin\*, 173, 112948.](#)

Marine debris, particularly plastic debris, is a ubiquitous global pervasive problem. The international community recognizes that a reduction in plastic debris density is central to sustainable ocean use based on reduction performance metrics. Although many national databases already exist or are being developed, an internationally accepted index of plastic debris density does not currently exist. Standardized methods for monitoring marine debris can help inform policy decisions to reduce sources marine debris and support mitigation effectiveness. Vietnam recently committed to addressing marine debris nationally and internationally and developed ambitious targets to manage and reduce ocean plastic debris, yet Vietnam does not currently have a national marine debris monitoring database. This study identified international best practices and standards; developed a marine plastic database for accurate, efficient information gathering, management, and reporting; and developed a centralized database platform for future marine plastic debris management in Vietnam that can be adapted for other jurisdictions.

[Walker, T.R., McGuinty, E., Charlebois, S., Music, J. \(2021\). Single-use plastic packaging in the Canadian food industry: consumer behavior and perceptions. \*Humanities and Social Sciences Communications\*, 8 \(1\), 80.](#)

Single-use plastic food packaging is a major contributor to the global solid waste problem. Although the food industry is developing strategies to reduce single-use plastic packaging, it needs to better

understand consumer awareness and attitudes about the issue. As consumer awareness about single-use plastic waste outpaces private sector practices, this study considered personal motivation factors, government policies, and innovative solutions related to single-use plastic food packaging. This Canada-wide study surveyed 1,014 consumers and their willingness to pay premiums for sustainable food packaging alternatives and motivations to reduce single-use plastic waste. Overwhelmingly, most (93.7%) respondents were personally motivated to reduce consumption of single-use plastic food packaging. Canadians were highly motivated to reduce single-use plastic food packaging, but less willing to pay for sustainable alternatives. While environmental concerns were more critical than food safety, Canadians acknowledged that sustainable packaging alternatives were more desirable than outright plastic bag bans, despite not being willing to pay for them. Using approaches that consider multiple driving factors on consumer behavior and opinions towards use of single-use plastic food packaging, limitations, recommendations and future research are proposed.

[Wang, H., Chang, H., Walker, T.R., Wang, Y., Wu, H., Luo, Q., Wang, X., Zhao, Y. \(2021\). Characterization and risk assessment of metals in surface sediments and riparian zone soils of Liaohe River, China. \*Applied Geochemistry\*, 134, 105104.](#)

Characterization and risk assessment of metals in surface sediments and riparian zone soils were studied in Liaohe River, northeast China. Surface sediment and riparian soil samples were collected from 24 monitoring sites along 538 km of Liaohe River. Metal concentrations and enrichment factors of Zn, Cr, Pb, Cu, Ni, and As were analyzed. Potential sources of metal contaminants along with ecological risk assessment and health risk via ingestion, inhalation, and dermal contact for residents were also assessed. Metal concentrations followed the order Cr > Zn > Cu > Ni > As > Pb in surface sediments, and Cr > Zn > Cu > Ni > Pb > As in riparian zone soils. The degree of metal pollution in Liaohe River sediments and riparian soils was considered moderate and is showing signs of recovery compared to historical concentrations reported previous studies. Enrichment factors also indicated metal pollution was not severe in both riparian and river sediments and were mainly derived from natural sources. Children had significantly higher health risks along the Liaohe River, and oral ingestion was the dominant exposure pathway. The major non-carcinogenic metal was Cr, and As was the main carcinogenic metal. Although carcinogenic and non-carcinogenic health risks of metals were considered low for both children and adults along the Liaohe River, future monitoring of metal contaminants, especially for As and Cr is recommended.

[Gündoğdu, S., Walker, T.R. \(2021\). Why Turkey should not import plastic waste pollution from developed countries? \*Marine Pollution Bulletin\*, 171, 112772.](#)

Turkey became a major importer of global plastic waste after China banned plastic imports on January 1, 2018. Turkey imported only 261,864 tonnes of plastic waste annually before the ban, but annual imports increased to 772,831 tonnes by 2020. Turkey recently implemented restrictions on importing plastic waste (quotas, %1 contamination limit, banned mixed plastic waste imports), yet illegal dumping and burning is widely reported. Turkey ranks second in Europe and seventh worldwide for plastics production, yet current domestic waste management and recycling programs cannot handle domestic plastic waste generation. Roughly 90% of municipal solid waste produced in Turkey ends up in landfills. Plastic waste mismanagement results in plastic leakage into the Mediterranean Sea with Turkey contributing the highest share (16.8%) of European marine plastic pollution. With this latest import restriction, Turkey now has an opportunity to strengthen and improve its own domestic waste management infrastructure to reduce indiscriminate plastic marine pollution.



Goodman, A.J., McIntyre, J., Smith, A., Fulton, L., Walker, T.R., Brown, C.J. (2021). Retrieval of abandoned, lost, and discarded fishing gear in Southwest Nova Scotia, Canada: Preliminary environmental and economic impacts to the commercial lobster industry. *Marine Pollution Bulletin*, 171, 112766.

Southwest Nova Scotia (SWNS) is Canada's most productive lobster (*Homarus americanus*) fishing region. Abandoned, lost, and discarded fishing gear (ALDFG) is widespread. This baseline study provides the first preliminary assessment of environmental and economic impacts of ALDFG on the commercial lobster industry in SWNS. Fishers conducted 60 retrieval trips, searched ~1523 km<sup>2</sup> of the seafloor and removed 7,064 kg of ALDFG (comprising 66% lobster traps and 22% dragger cable). Results showed that lost traps continued to capture target and non-target species until gear degraded. A total of 15 different species were released from retrieved ALDFG, including 239 lobsters (67% were market-sized) and seven groundfish (including five species-at-risk). The present findings, combined with information on regional fishing effort and market prices, estimate that commercial losses from ALDFG can exceed \$175,000 CAD annually. This baseline assessment provides useful data for government and commercial fishing stakeholders to improve ALDFG management.

Davidson, K.B., Holmes, B.E.J., Spooner, I.S., Dunnington, D.W., Walker, T.R., Lake, C.B., Su, C.-C. (2021). Application of the paleolimnological method to assess metal contaminant distribution (As, Cu, Pb, Zn) in pulp mill stabilization basin sediments, Nova Scotia, Canada. *Environmental Science and Pollution Research*, 28 (37), 51342-51355.

The paleolimnological method was used to decouple geogenic and anthropogenic metal (loids) contributions in a sediment stabilization basin (Boat Harbour) located in Nova Scotia, Canada. Boat Harbour has been impacted by industrial effluents discharged by a bleached kraft pulp mill (1967 to 2019) and a chlor-alkali plant (1971 to 1992). The former estuary now contains >577,000 m<sup>3</sup> of unconsolidated sediment, impacted by inorganic and organic contaminants, including metal[loid]s, polycyclic aromatic hydrocarbons and polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans. Previous studies indicated significant knowledge gaps in our understanding of the spatial, stratigraphic, and temporal variation of sediment contamination. Twenty-five lakebed sediment gravity cores were obtained between 2016 and 2019 to determine spatiotemporal distribution of sediment As, Cu, Pb, and Zn concentrations which consistently exceeded guidelines for aquatic sediments. Results demonstrate there is no distinct spatial trend in metal concentrations despite point source effluent inputs. High and variable concentrations of Cu and Zn in contaminated sediment likely represent a combination of cation capture by highly organic sediment and influence of pulp mill on lakebed sediment chemistry. Elevated Pb in contaminated sediment is the result of atmospheric deposition from combustion of fossil fuels and bioaccumulation in effluent feedstock. Average sedimentation rate (1 cm every 3 years) is high compared to a nearby freshwater lake and is enhanced by increased nutrient loading and more productive water column conditions associated with effluent introduction. Temporal trends indicate significantly higher concentrations of Zn and Cu in top sediment samples consistent with changes in effluent treatment procedures as well as composition of effluent solids. Comparison of geochemistry of effluent influenced sediment and pre-effluent substrate sediment at Boat Harbour to freshwater and marine reference was required to understand the degree to which geogenic and anthropogenic sources of metal(loids) have influenced effluent chemistry. This study demonstrates that undisturbed, time transgressive samples from both impacted sites and reference sites combined with non-destructive, rapid, small sample analytical techniques such as X-ray fluorescence, provide an accurate assessment of sediment metal contaminant distribution, data required to guide remediation and environmental effects monitoring and compliance.

Khoshnamvand, M., Hanachi, P., Ashtiani, S., **Walker, T.R.** (2021). Toxic effects of polystyrene nanoplastics on microalgae *Chlorella vulgaris*: Changes in biomass, photosynthetic pigments and morphology. *Chemosphere*, 280, 130725.

Presence of nanoplastics within aqueous media has raised concerns about their adverse impacts on aquatic organisms. This study evaluated toxic effects of amino-functionalized polystyrene nanoplastics (PS-NH<sub>2</sub>) with diameters of 90 (PS-NH<sub>2</sub>-90), 200 (PS-NH<sub>2</sub>-200) and 300 (PS-NH<sub>2</sub>-300) nm on green microalgae *Chlorella vulgaris*. A dose-dependent toxicity response by PS-NH<sub>2</sub>-90 and/or PS-NH<sub>2</sub>-200 on biomass and photosynthetic pigment (chlorophyll a) end-points of *C. vulgaris* was observed. Whereas varied concentrations of PS-NH<sub>2</sub>-300 had no significant toxic effect on biomass and chlorophyll a end-points compared to control groups ( $p > 0.05$ ). A comparison of toxicity of similar concentrations of PS-NH<sub>2</sub>-90, PS-NH<sub>2</sub>-200 and PS-NH<sub>2</sub>-300 showed small-sized PS-NH<sub>2</sub> were more toxic than large-sized PS-NH<sub>2</sub> (toxicity of PS-NH<sub>2</sub> increased in the order PS-NH<sub>2</sub>-300 < PS-NH<sub>2</sub>-200 < PS-NH<sub>2</sub>-90). With decreasing PS-NH<sub>2</sub> size, greater morphological changes and loss of original shape were observed, so that algal density/size reduced, and cell aggregations increased. Since PS-NH<sub>2</sub> have high affinity to *C. vulgaris* due to electrostatic interaction with polysaccharide wall of algae, this could be as the main reason for formation of large aggregates at high concentrations of PS-NH<sub>2</sub> compared to low concentrations of PS-NH<sub>2</sub> used in algae medium. At high concentrations, PS-NH<sub>2</sub> may act as intermediaries for connection of algal cells and therefore formation of aggregates. Field emission scanning electron microscopy images confirmed that high amounts of PS-NH<sub>2</sub>-90 were found to be embedded and adsorbed on algal cells, thereby limiting transfer of materials, gas exchange and energy between the aqueous medium and algal cells. These data may have serious ecological health implications, as *C. vulgaris* are important primary producers responsible for producing oxygen in aquatic environments.

Varkey, P.S., **Walker, T.R.**, Saunders, S.J. (2021). Identifying barriers to reducing single-use plastic use in a coastal metropolitan city in Canada. *Ocean and Coastal Management*, 210, 105663.

Nearly half of all plastic produced is discarded after a single use. Single-use plastics (SUPs) are persistent in the environment and commonly found during shoreline and coastal cleanups. The food service industry is a major source of SUPs used by consumers. Business recognition programs can help reduce SUP use in the food service industry but have only been implemented in small coastal communities in Nova Scotia (e.g., Ocean Friendly Nova Scotia [OFNS]). Due to its coastal proximity, Halifax Regional Municipality (HRM) was chosen for this case study. HRM is the largest coastal metropolitan city in Nova Scotia and has potential for SUP leakage into the marine environment, but currently has no business recognition program to reduce SUP use. Using quantitative and qualitative methods, this study identified the main barriers to reducing SUP use in HRM. Two online surveys gauged interest in reducing SUP use among community members and food-based businesses in HRM. Follow up interviews with interested businesses aimed to understand concerns and challenges faced by business owners to reduce SUP use, and subsequent potential leakage into the marine environment. Results indicate overwhelming public interest in SUP reduction, as well as concerns among businesses about sourcing sustainable alternatives. Recommendations include increasing accessibility of sustainable alternatives, a guide for best practices, and public education. These recommendations may serve as a roadmap for SUP reduction strategies across different jurisdictions.

Adam, I., **Walker, T.R.**, Clayton, C.A., Carlos Bezerra, J. (2021). Attitudinal and behavioural segments on single-use plastics in Ghana: Implications for reducing marine plastic pollution. *Environmental Challenges*, 4, 100185.

Recent research attention has been directed at legislative and market-based instruments with little recourse to understanding attitudinal and behavioural responses to single-use plastics (SUPs). Using the tri-component model, this study examines attitudinal and behavioural segments on SUPs amongst residents in coastal cities of Accra and Cape Coast in Ghana. A questionnaire was used to solicit data from 2,345 residents selected using the multi-stage sampling technique. Findings show that there are three attitudinal clusters on SUPs amongst residents, namely avoiders, potential avoiders and patrons. Avoiders have unfavourable attitudes towards SUPs and as such avoid consumption of SUPs, while potential have unfavourable attitudes towards SUPs, but with a lower level of avoidance and thus sometimes use them. Patrons have favourable attitudes towards SUPs and equally consume them. Each of these three attitudinal clusters varies across the socio-demographic characteristics of residents. The implications of these findings towards the reduction of marine SUP pollution are discussed.

Wang, H., Zhao, Y., **Walker, T.R.**, Wang, Y., Luo, Q., Wu, H., Wang, X. (2021). Distribution characteristics, chemical speciation and human health risk assessment of metals in surface dust in Shenyang City, China. *Applied Geochemistry*, 131, 105031.

Surface dust samples were collected in 2018 at 30 different sites in Shenyang City, China. Concentrations of chromium (Cr), arsenic (As), copper (Cu), lead (Pb), zinc (Zn), nickel (Ni), mercury (Hg) and cadmium (Cd) were determined, and chemical speciation of metals were analyzed. Mean metal concentrations followed the order Zn > Cu > Pb > Cr > Ni > As > Cd > Hg. Although concentrations of metals in dust samples were lower than previously reported, a measurable metal pollution signature in dust still exists. Metals (except for As), are influenced by anthropogenic activities. Spatial variation in mean metal dust concentrations and speciation varied significantly and were influenced by land-use and industrial activities. Source appointment results revealed that pollution of surface dust was derived from three main source profiles (industrial and traffic pollution, coal combustion, and urban pollution), contributing to 90.7% of the variance. Health risk assessment indicated that risks were low, but children were susceptible to metals in surface dust. Results indicated oral ingestion was the dominant exposure pathway. Non-carcinogenic Cr and Pb and carcinogenic As were the main metal contaminants in surface dust.

**Walker, T.R.** (2021). Plastic industry plan to sue the Canadian federal government for listing plastic as toxic may increase plastic marine pollution. *Marine Pollution Bulletin*, 169, 112583.

**Walker, T.R.** (2021). Why are we still polluting the marine environment with personal protective equipment? *Marine Pollution Bulletin*, 169, 112528.

Quanz, M.E., **Walker, T.R.**, Oakes, K., Willis, R. (2021). Effects of industrial effluent on wetland macroinvertebrate community structures near a wastewater treatment facility. *Ecological Indicators*, 127, 107709.

Macroinvertebrate communities and environmental variables were examined in wetlands near an industrial wastewater treatment facility to assess impacts from exposure to historical effluents. Baseline wetland assessments were required prior to cleanup of contaminated sediments at the facility. The study included wetlands historically exposed to direct effluent discharge, wetlands exposed to current effluent discharge (at the time of sampling), and reference wetlands. Wetlands were sampled in June, July, and September 2018 using a new macroinvertebrate community monitoring protocol ("Wetland CABIN") developed by Environment and Climate Change Canada. Macroinvertebrates were counted and identified to Family level. Data were qualitatively analyzed using pie charts and nonmetric multidimensional scaling, as well as quantitatively with the Shannon-Weiner diversity index, the Berger-

Parker index and using pollution sensitivity values. Correlations using Spearman rho were also calculated between indices and measured environmental variables. Wetlands near the treatment facility were not significantly different compared to reference sites. Macroinvertebrate communities near the treatment facility appeared to be relatively unimpacted by historical effluent inputs. The Wetland CABIN protocol may be a useful monitoring tool for assessing wetland macroinvertebrate community structure because it allows for standardized approaches to be used to compare temporal changes at contaminated sites or spatially between sites.

**Walker, T.R.** (2021). (Micro)plastics and the UN Sustainable Development Goals. *Current Opinion in Green and Sustainable Chemistry*, 30, 100497.

Since the launch of the United Nations (UN) Sustainable Development Goals (SDGs) in 2015, the SDGs have been widely adopted by governments and corporations in an effort to improve their sustainability. There are 17 SDGs, comprising 169 targets, which are measurable against 247 unique indicators. Despite pervasive global pollution from (micro)plastics, there is only one indicator (14.1.1b) under Goal 14, specifically related to reducing impacts from (micro)plastics. Reliable reporting and monitoring of 247 SDG indicators present unique challenges for governments and organizations to implement, which may be further exacerbated by the pervasive nature of (micro)plastic pollution if not properly monitored across these indicators. This review focused on recent literature to provide a critical overview of the key challenges specifically related to (micro)plastics as they may undermine the implementation of sustainable strategies and action plans required to achieve the UN SDGs.

**Walker, T.R.** (2021). Canada is right to classify single-use plastics as toxic. *Nature*, 594 (7864), 496.

Carlos Bezerra, J., **Walker, T.R.**, Clayton, C.A., Adam, I. (2021). Single-use plastic bag policies in the Southern African development community. *Environmental Challenges*, 3, 100029.

The growing visibility of plastic pollution, particularly negative environmental impacts of single-use plastic bags, has entered the political debate, triggering policy interventions to control its manufacturing and use. This trend was also felt in Southern Africa, a region with high urbanization, leading to increased resource use and plastic consumption, heavily reliant on tourism, an industry highly impacted by plastic pollution. This paper reviews existing single-use plastic bag reduction policies in the Southern African Development Community (SADC). All 16 SADC members have announced a plastic bag reduction policy, but interventions vary in stages of implementation. Waste management emerged as the most important policy driver and over 55% of SADC members adopted a top-down approach in developing these policies to address these environmental challenges. Most SADC members with existing policies did not conduct public awareness campaigns, raising effectiveness issues. Further research on effective plastic bag reduction policy development, enforcement and monitoring would address an important knowledge gap.

Quanz, M.E., **Walker, T.R.**, Oakes, K., Willis, R. (2021). Contaminant characterization in wetland media surrounding a pulp mill industrial effluent treatment facility. *Wetlands Ecology and Management*, 29 (2), 209-229.

Three media (sediment, surface water, and dragonfly larvae tissue) were collected from wetlands surrounding an industrial effluent treatment facility prior to closure. Samples were analyzed for metals, total mercury, and polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/PCDF) concentrations. Sediment and surface water concentrations were compared to provincial and federal

guidelines, as well as reference wetland concentrations. Exceedances of arsenic, cadmium, chromium, copper, zinc, and PCDD/PCDF guidelines were found in deeper areas of wetlands historically contaminated from effluent, as well as wetlands exposed to current effluent inputs. Composite Libellulidae samples were collected from wetlands, and comparisons were made to reference tissue concentrations + 20%. Elevated As, Cu and Pb tissue concentrations were measured at two site wetlands, but total mercury (THg) and PCDD/PCDF reference tissue concentrations were higher than wetlands near the effluent treatment facility. Spearman rho tests identified a significant correlation between sediment and tissue Pb concentrations and between surface water and sediment THg concentrations. Results suggest relatively low ecological risk to macroinvertebrates within wetlands near the effluent treatment facility from current effluent inputs, and highlight strengths and weaknesses of federal and provincial guidelines.

[Wright, R.J., Langille, M.G.I., Walker, T.R. \(2021\). Food or just a free ride? A meta-analysis reveals the global diversity of the Plastisphere. \*ISME Journal\*, 15 \(3\), 789-806.](#)

It is now indisputable that plastics are ubiquitous and problematic in ecosystems globally. Many suggestions have been made about the role that biofilms colonizing plastics in the environment—termed the “Plastisphere”—may play in the transportation and ecological impact of these plastics. By collecting and re-analyzing all raw 16S rRNA gene sequencing and metadata from 2,229 samples within 35 studies, we have performed the first meta-analysis of the Plastisphere in marine, freshwater, other aquatic (e.g., brackish or aquaculture) and terrestrial environments. We show that random forest models can be trained to differentiate between groupings of environmental factors as well as aspects of study design, but—crucially—also between plastics when compared with control biofilms and between different plastic types and community successional stages. Our meta-analysis confirms that potentially biodegrading Plastisphere members, the hydrocarbonoclastic Oceanospirillales and Alteromonadales are consistently more abundant in plastic than control biofilm samples across multiple studies and environments. This indicates the predilection of these organisms for plastics and confirms the urgent need for their ability to biodegrade plastics to be comprehensively tested. We also identified key knowledge gaps that should be addressed by future studies.

[Karbalaeei, S., Hanachi, P., Rafiee, G., Seifori, P., Walker, T.R. \(2021\). Toxicity of polystyrene microplastics on juvenile \*Oncorhynchus mykiss\* \(rainbow trout\) after individual and combined exposure with chlorpyrifos. \*Journal of Hazardous Materials\*, 403, 123980.](#)

Microplastic (MP) sorption and transfer of chemical contaminants has been widely reported, yet few studies have investigated combined effects of contaminant-loaded MPs on organisms. This study examined effects of pristine or chlorpyrifos (CPF)-loaded polystyrene (PS) fragments on histopathological and histomorphometrical biomarkers in rainbow trout (*Oncorhynchus mykiss*). In laboratory, *O. mykiss* were exposed for 96 h to pristine PS-MPs concentrations (30 or 300 µg/L), concentrations of CPF alone (2 or 6 µg/L), and the same concentrations of CPF in the presence of PS-MPs in aquaria. Results showed the highest histopathological alterations in both CPF concentrations and when combined with PS-MPs in fish gills. Alternatively, high histopathological lesions including massive necrosis, infiltration of inflammatory cells, and shed of villi tips were observed in fish gut in high CPF concentrations combined with high PS-MP concentrations of (6 µg/L CPF+300 µg/L PS-MPs). Individual CPF and PS-MP concentrations or combined together showed significant changes in histomorphometrical biomarkers in fish gills, gut and skin. Findings highlight that pristine PS-MPs cause toxicity and increase adverse effects of CPF in *O. mykiss*, especially in gill tissue. We present evidence

that pristine short-term exposure to even low concentrations of PS-MPs has a significant impact on biomarker responses in *O. mykiss*.

Patrício Silva, A.L., Prata, J.C., **Walker, T.R.**, Duarte, A.C., Ouyang, W., Barcelò, D., Rocha-Santos, T. (2021). Increased plastic pollution due to COVID-19 pandemic: Challenges and recommendations. *Chemical Engineering Journal*, 405, 126683.

Plastics have become a severe transboundary threat to natural ecosystems and human health, with studies predicting a twofold increase in the quantity of plastic debris (including micro and nano-sized plastics) by 2030. However, such predictions will likely be aggravated by the excessive use and consumption of single-use plastics (including personal protective equipment such as masks and gloves) due to COVID-19 pandemic. This review aimed to provide a comprehensive overview on the effects of COVID-19 on macroplastic pollution and its potential implications on the environment and human health considering short- and long-term scenarios; addressing the main challenges and discussing potential strategies to overcome them. It emphasises that future measures, involved in an emergent health crisis or not, should reflect a balance between public health and environmental safety as they are both undoubtedly connected. Although the use and consumption of plastics significantly improved our quality of life, it is crucial to shift towards sustainable alternatives, such as bio-based plastics. Plastics should remain in the top of the political agenda in Europe and across the world, not only to minimise plastic leakage and pollution, but to promote sustainable growth and to stimulate both green and blue-economies. Discussions on this topic, particularly considering the excessive use of plastic, should start soon with the involvement of the scientific community, plastic producers and politicians in order to be prepared for the near future.

**Walker, T.R.**, McKay, D.C. (2021). Comment on "Five Misperceptions Surrounding the Environmental Impacts of Single-Use Plastic". *Environmental Science and Technology*, 55 (2), 1339-1340.

Alimohammadi, M., Tackley, H., Holmes, B., Davidson, K., Lake, C.B., Spooner, I.S., Jamieson, R.C., **Walker, T.R.** (2021). Characterising sediment physical property variability for bench-scale dewatering purposes. *Environmental Geotechnics*.

A field sampling programme was undertaken to assess the variability of physical characteristics of contaminated sediments in a large (160 ha) effluent stabilisation lagoon. The objective of this paper is to use this 'field lab' as a basis for comparing different sampling techniques (i.e. discrete and composite) for remediation-based evaluations (i.e. sediment volume estimates and bench-scale dewatering studies). The distribution of sediment thickness measured throughout the lagoon by gravity core sampling is presented for context. Selected gravity core sediment samples are evaluated with respect to physical property (water/solids content, bulk density and particle size) variability in both the vertical (i.e. within a single gravity core) and spatial directions (among gravity cores). Composite samples are created by way of homogenisation of a single entire gravity core to compare their properties to the discrete and average physical properties of a nearby gravity core. Vacuum-based samples are also compared to gravity core samples in terms of particle size. It is demonstrated that by understanding sediment variability, composite samples can be shown to be an efficient method of obtaining representative samples. When large samples for dewatering trials are required, vacuum sampling can produce samples with similar mean particle size to discrete and composite samples.

Wang, H., Chen, Z., **Walker, T.R.**, Wang, Y., Luo, Q., Wu, H., Wang, X. (2021). Characterization, source apportionment and risk assessment of PAHs in urban surface dust in Shenyang city, China. *Environmental Geochemistry and Health*.

Characteristics, profile composition, ecological and human health risk of polycyclic aromatic hydrocarbons in surface dust collected from Shenyang city, China, were investigated. Concentrations of 16 USEPA priority PAHs ranged between 371.57 and 3300.04  $\mu\text{g}/\text{kg}$  (mean  $1244.76 \pm 715.25 \mu\text{g}/\text{kg}$ ). Fluoranthene was the most abundant individual PAH, followed by pyrene, and high molecular weight PAHs, more than three times of low molecular weight PAHs, were the predominant components. Profiles of PAHs showed that 4-ring PAHs were dominant, followed by 3-ring and 5-ring PAHs, and indicated that combustion sources accounted for the most PAHs. Results of diagnostic ratios and positive matrix factorization all suggested that pyrogenic sources were the most important source of PAHs in urban dust, followed by natural gas combustion and petrogenic sources, and traffic emissions would play an increasingly critical role with the increasing of vehicles. Health risk assessment suggested children were the most vulnerable to PAHs compared to adolescents and adults. Ingestion was the most important exposure pathway. The total lifetime cancer risk of 43.33% of sampling sites was higher than  $10^{-6}$ , but the TCR at all sites was much lower than the highest acceptable risk established by USEPA ( $10^{-4}$ ).

Kitz, R., **Walker, T.**, Charlebois, S., Music, J. (2021). Food packaging during the COVID-19 pandemic: Consumer perceptions. *International Journal of Consumer Studies*, 46 (2), 434-448.

While plastics play an important role in the safety, shelf-life, and affordability of many foods, their mismanagement as waste presents a serious environmental problem. In 2019, governments in Canada and globally were poised to take legislative action to curb the use of single-use plastics, with strong public support. However, the COVID-19 pandemic has since disrupted those initiatives as well as the public sentiment underlying them. The aim of our study is to measure changes in Canadian consumers' attitudes toward single-use plastic food packaging, from Summer 2019 to Summer 2020. The methodology relies on two representative surveys of the Canadian population, carried out in May 2019 ( $n = 1,094$ ) and in June 2020 ( $n = 977$ ). Our measures explored potential impacts on consumer perceptions, driven both by new food safety concerns during the pandemic and also by increased price consciousness during a time of economic recession. We found that 55% of respondents were more concerned about food safety since COVID-19, and that 50% of respondents had become more price conscious when buying groceries. However, we found only a slight decline in motivation to reduce plastics – though with a sharper reduction among males. A stronger shift was seen in attitudes towards policy, where our results show a clear decline in support for tighter regulations or bans on single-use plastics, along with an increase in consumers' willingness to pay for biodegradable alternatives. These findings suggest a more difficult road ahead for legislative approaches, but also potential opportunities for market-based strategies and innovations in the food sector.

Linnebjerg, J.F., Baak, J.E., Barry, T., Gavrilo, M.V., Mallory, M.L., Merkel, F.R., Price, C., Strand, J., **Walker, T.R.**, Provencher, J.F. (2021). Review of plastic pollution policies of Arctic countries in relation to seabirds. *Facets*, 6 (1).

Marine plastic is a ubiquitous environmental problem that can have an impact on a variety of marine biota, such as seabirds, making it an important concern for scientists and policy makers. Although research on plastic ingestion by seabirds is increasing, few studies have examined policies and long-term monitoring programs to reduce marine plastic in the Arctic. This paper provides a review of

international, national, and regional policies and long-term monitoring programs that address marine plastic in relation to seabirds in the Arctic countries: Canada, the Kingdom of Denmark (Greenland and the Faroe Islands), Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States of America. Results show that a broad range of international, national, regional and local policies address marine debris, specifically through waste management and the prevention of pollution from ships. However, few policies directly address seabirds and other marine biota. Further, policies are implemented inconsistently across regions, making it difficult to enforce and monitor the efficacy of these policies given the long-range transport of plastic pollution globally. To reduce marine plastic pollution in the Arctic environment, pan-Arctic and international collaboration is needed to implement standardized policies and long-term monitoring programs for marine plastic in the Arctic and worldwide.

Clayton, C.A., Walker, T.R., Bezerra, J.C., Adam, I. (2021). Policy responses to reduce single-use plastic marine pollution in the Caribbean. *Marine Pollution Bulletin*, 162, 111833.

Caribbean economies depend heavily on a healthy marine ecosystem, but the region includes ten of the top global marine polluters per capita. Regional marine pollution is driven by illegal plastic waste dumping due to poor waste management systems with limited recycling, and weak enforcement. Governments recognize the impacts of marine debris on their social and economic well-being and have responded with policies to curb plastic pollution. Most focus on bans of single-use plastic and polystyrene, which comprises ~80% of Caribbean marine litter. However, there is little comparative analysis of policy responses to determine their efficacy. This paper reviews current policies in 13 English-speaking Caribbean countries, exploring tools used and process of implementation. Eleven have introduced legislative policies, with seven including fines and penalties for non-compliance. All successful policies involve multiple tools, including primary stakeholder engagement, sufficient lead time between policy announcement and implementation, and extensive public education campaigns.

Westwood, A. R., Hutchen, J., Kapoor, T., Klenk, K., Saturno, J., Wang, J., Falconer, M., Nguyen, V. M. (2021). A systematic mapping protocol for understanding knowledge exchange in forest science. *Ecological Solutions and Evidence*, 2, e12096.

(1) When making decisions about forest and environmental management, managers and policymakers often rely upon scientific knowledge. There is a well-documented 'knowledge–integration gap' where often the production of knowledge and its use are not aligned. Though there are several theoretical frameworks that conceptualize how knowledge is exchanged between producers of scientific knowledge and users of that information, there has been little attention to documenting knowledge exchange practices and their effectiveness, especially about forests. (2) In the systematic map, we will examine the peer-reviewed academic and grey literature to document and classify the knowledge exchange techniques suggested and adopted by knowledge producers and users in the forest sciences globally. Characterizing this knowledge exchange landscape will provide new information about which techniques are used and their frequency, if there is evidence of effectiveness for particular techniques, and recommendations for best practices. This map will also show whether approaches to knowledge exchange differ between sectors (e.g. academia, government). (3) We will create a systematic literature map as defined by the Collaboration for Environmental Evidence to capture case studies of, or theories about, knowledge exchange related to forest science. The search of peer-reviewed academic and grey literature will be conducted in English and French in two academic databases (BASE and Scopus) and one specialist database (ResearchGate). Candidate search strings will be evaluated against a test list of documents to determine strings with maximum sensitivity and specificity. Eligibility criteria will be applied to items at two screening stages: (1) title and abstract and (2) full-text. All screening decisions



will be recorded in a database with 15% of full-text screening decisions validated. Items retained for inclusion will have data extracted according to a standardized strategy. Each reviewer conducting data extraction will have at least three of their extractions validated. (4) The systematic map will employ a narrative synthesis approach that includes descriptive statistics, tables, and figures which describe the types and frequency of knowledge exchange techniques theorized or described, a network map displaying the institutions within and between which knowledge exchange occurs, as well as summarizing any available evidence of effectiveness for particular knowledge exchange techniques.

[Zurba, M., Sinclair, A.J., Diduck, A.P. \(2021\). "Two-Row" cross-cultural learning for collaborative governance of forestland in northwestern Ontario, Canada. \*Regional Environmental Change\*, 21 \(2\), 57.](#)

This paper investigates learning occurring through cross-cultural collaboration and how learning processes and outcomes of such learning affect the governance of regional lands and resources in the context of a First Nation-industry partnership in northwestern Ontario, Canada. We use transformative learning theory as a basis for critically analyzing individual, social, and structural changes. Transformative theory has been found to be suitable for working with natural resource problems and has evolved over time to include ways for accounting for different cultural frames of reference. We attempted a decolonizing approach in our research methodology hoping to understand learning events and outcomes as expressed by the research participants according to their own worldviews. Thirty-six participants involved in the First Nation-industry partnership were engaged in semi-structured interviews. Our results reveal different events that catalyzed both transformative and culturally framed learning outcomes for participants, such as much deeper appreciation for cultural practices and shared understanding of provincial forest policies. Four types of events were identified as catalysts for such learning outcomes: (i) time spent on the land; (ii) social meetings; (iii) ceremony, and (iv) formal meetings. Each type of learning event corresponded with different learning outcomes that arose from being involved in the partnership. Drawing from the literature on transformative and Indigenous learning, our study resulted in a synthetic "two-row" frame for cross-cultural learning and demonstrates that this learning was important for building cross-cultural collaborations for resource use.

[Zurba, M., Papadopoulos, A. \(2021\). Indigenous participation and the incorporation of Indigenous knowledge and perspectives in global environmental governance forums: a systematic review. \*Environmental Management\*.](#)

Global environmental governance (GEG) forums, such as those convened through the United Nations, result in the development of monumental guiding frameworks such as the Sustainable Development Goals (SDGs) and the Convention on Biological Diversity (CBD) Conference of Parties (COPs) Aichi and post-2020 targets. The ratification of policy frameworks by member and/or signatory states can result in major shifts in environmental policy and decision-making and has major implications for Indigenous communities. In this article, we present systematic review of the peer-reviewed literature on Indigenous participation in GEG forums, and focus on the specific questions: (1) what GEG forums include Indigenous participation and (2) how do Indigenous peoples participate in GEG forums, including how their perspectives and knowledges are framed and/or included/excluded within governance discussions, decisions, and negotiations. We provide a bibliometric analysis of the articles and derive seven inductively determined themes from our review: (1) Critical governance forums and decisions; (2) inclusion and exclusion of Indigenous voices and knowledge in GEG forums; (3) capacity barriers; (4) knowledge hierarchies: inclusion, integration, and bridging; (5) representation and grouping of Indigenous peoples in GEG; (6) need for networks among and between Indigenous peoples and other governance actors; and (7) Indigenous peoples influence on GEG decisions and processes. Our findings

can be used to improve GEG forums by contributing to the development strategies that address the barriers and inequities to meaningful and beneficial Indigenous participation and can contribute to future research that is focused on understanding the experiences of Indigenous peoples within GEG forums.

**Zurba, M., Land, G., Bullock, R., Graham, B. (2021).** Exploring Indigenization and decolonization in cross-cultural education through collaborative land-based boundary education. *Journal of Cultural Geography*.

This article considers the potential for collaboratively produced boundary education as an advancement of the boundary work concept in academia. The boundary work process aims to support collaboration that works around social, cultural, political, epistemological, and other forms of boundaries. We explore how education can act as a boundary object through the development and implementation of a pilot project for land-based educational programming offered through a university. In particular, we share observations arising through a land-based education initiative that engaged Indigenous land stewards from Wabaseemoong Independent Nation and students from The University of Winnipeg. Our approach is grounded in an extended conceptual framework and process for conducting boundary work in the context of collaborative educational design and implementation involving educators from academia and Indigenous community partners. The pilot project provided baseline insights for future boundary education collaborations and provided some direction for future work.

**Zurba, M., Petriello, M.A., Madge, C., McCarney, P., Bishop, B., McBeth, S., Denniston, M., Bodwitch, H., Bailey, M. (2021).** Learning from knowledge co-production research and practice in the twenty-first century: global lessons and what they mean for collaborative research in Nunatsiavut. *Sustainability Science*.

An increasing need for novel approaches to knowledge co-production that effectively and equitably address sustainability challenges has arisen in the twenty-first century. Calls for more representative and contextual co-production strategies have come from indigenous communities, scientific research forums, and global environmental governance networks. Despite calls to action, there are no systematic reviews that derive lessons from knowledge co-production scholarship to interpret their significance through the lens of a specific sociopolitical and cultural context. We conducted a systematic review of peer-reviewed and grey literature on knowledge co-production published from 2000 to 2020. Using a hybrid inductive and deductive thematic analysis, we identified two conceptual themes—guiding principles and approaches—to structure the synthesis and interpretation of 102 studies. We found that knowledge co-production studies often converged on four interrelated principles: recognition of contextual diversity bounding knowledge co-production, preemptive and intentional engagement with indigenous knowledge holders, formation of shared understanding of the purpose of knowledge co-production, and empowerment of knowledge holders throughout the co-production cycle. These principles manifested in multiple approaches for interpreting, bridging, applying, and distributing power amongst diverse knowledge systems rooted in different epistemologies. We filter these findings through the social–ecological context that frames an ongoing knowledge co-production project with Inuit communities in Nunatsiavut, Canada: the Sustainable Nunatsiavut Futures Project. Our review suggests that emerging forms of knowledge co-production principles and approaches yield immense potential in diverse contexts. Yet in many regions, including Nunatsiavut, principles alone may not be enough to account for systemic and contextualized issues (e.g., colonization and data sovereignty) that can present roadblocks to equitable sustainability science in the twenty-first century if left unaddressed.