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SUMMARY

Founding Director, Centre for Bioengineering and Biotechnology

Accomplishments:

- Built and established an interdisciplinary research centre of 140 faculty members across 5 faculties.
- Worked across faculties to build strong relationships
- Developed strong relationships with regional hospitals and health care community
- Established new international relationships with two universities (Netherlands, France)
- Established Memorandums of Understanding with UTwente, Medical Device Commercialization Centre, Ottawa
- Increased funding in the areas of biotechnology and biomedical engineering by \$4.8 million over four years
- Engaged 162 companies with researchers
- Achieved a 77% participation rate among centre researchers in centre activities

Director, Advanced Interface Design Lab

Accomplishments

- Led an internationally recognized program of research in Human Factors Engineering
- Fellow of the Human Factors and Ergonomics Society
- Substantial academic contributions, over 250 scholarly publications including 7 books
- Attracted nearly 10 million in research funding
- Leadership in funding agencies in Canada and internationally, Chair of committees for NSERC and Ontario Ministry of Research Innovation and Science, NSERC Ontario Advisory Board
- Holds editorial board or Associate Editor positions at 5 top journals in the field
- Research Excellence Award winner
- Award for Excellence in Graduate Supervision

Professor, Systems Design Engineering

Accomplishments

- Led the development of a graduate program in Biomedical Engineering
- Leadership roles in service to department and university

EDUCATION

- 1998 Professional Engineers of Ontario Licence
- 1998 PhD, Mechanical and Industrial Engineering, University of Toronto
- 1994 MAsC, Industrial Engineering, University of Toronto
- 1992 BAsC, Systems Design Engineering, University of Waterloo

ADMINISTRATIVE POSITIONS

- 2011-present Executive Director, Centre for Bioengineering and Biotechnology

AWARDS

- 2017 Outstanding Performance Award, University of Waterloo
- 2016 Award for Excellence in Graduate Supervision, Faculty of Engineering
- 2015 Fellow, Human Factors and Ergonomics Society
- 2014 Outstanding Performance Award, University of Waterloo
- 2013 Outstanding Performance Award, University of Waterloo
- 2010 Outstanding Performance Award, University of Waterloo
- 2009 Research Excellence Award, Faculty of Engineering
- 2008 NSERC Discovery Accelerator Supplement
- 2007 Outstanding Performance Award, University of Waterloo
- 2006 Teaching Excellence Award, Faculty of Engineering
- 1995 NSERC PGS-D Scholarship

PUBLICATION SUMMARY

Books: 7

Chapters in Edited Books: 12

Published Journal Papers: 59

Conference Papers (full paper): 95

Conference Papers (abstract):43

Standards Documents: 3

Technical Reports: 48

Other Publications: 3

Total Publications: 270

TOTAL CAREER RESEARCH FUNDING

\$9, 860, 351

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LIST OF PUBLICATIONS

(* indicates student co-authors)

Books

1. Bisantz, A., Burns, C.M. and Fairbanks, T. (2014). *Cognitive Systems Engineering in Health Care*. CRC Press.
2. Hou, M., Banbury, S. and Burns, C.M. (2014). *Intelligent Adaptive Systems: An Interaction-Centered Design Perspective*. CRC Press.
3. Bullemer, P., Hajdukiewicz, J., Burns, C. (2009). *Effective Procedural Practices*. ASM Consortium, USA.
4. Bullemer, P., Burns, C., Hajdukiewicz, J. (2009). *Alarm Management*. ASM Consortium, USA
5. Bullemer, P., Reising, D.V., Burns, C., Hajdukiewicz, J., Andrzejewski, J. (2009). *Effective Operator Display Design*. ASM Consortium, USA.
6. Bisantz, A.M. and Burns, C. M. (2008). *Applications of Cognitive Work Analysis*. Taylor and Francis Group, CRC Press, Boca Raton, FL.
7. Burns, C. M. and Hajdukiewicz, J. R. (2004). *Ecological Interface Design*. Taylor and Francis Group, CRC Press, Boca Raton, FL.

Invited Chapters in Edited Books

1. Burns, C.M. (invited). CWA: Models of expertise. *Oxford Handbook of Expertise*. Oxford University Press. (E. Roth, Ed.)
2. Burns, C.M. (invited). Human centred design. *E-health technology: Theory, development and evaluation*. Centre for e-Health and Well being research. (J.E.W.C. van Gemert-Pijnen and R. Sanderman (Eds.) University of Twente, Enschede, ND.
3. Burns, C.M. Lucena*, C.A. (in press). Information and Communication Technology (ICT) and Human Interaction. *Human factors and ergonomics for the gulf cooperation council: Processes, technologies, and practices*. S. Samman (Ed.), CRC Press, Boca Raton, FL.
4. Burns, C.M, Euerby, A. (2018). Increasing social connection through a community of practice inspired design. *Information systems: Processes and Practices 2*. C. Urquhart (Ed.) (Chapter 11, 185-204.) Facet Publishing, UK.
5. Burns, C.M. (2017). CWA: Lens on work. *Cognitive Work Analysis: Applications, extensions and the future*. N. Stanton, P.A. Salmon, G.H. Walker, D.P. Jenkins (Eds.) Taylor and Francis, Boca Raton, FL.
6. Minotra*, D., Dikmen*, M., Ho*, A., McNeese, M., Burns, C.M. (2017). *Scaled world simulations in attention allocation research: Methodological issues and directions for future work*. Cognitive Systems Engineering: An Integrative Living Laboratory. Taylor and Francis, CRC Press.
7. Abdelnour-Nocera, J., Oussena, S., Burns, C.M. (2015). Human work interaction design of the smart university. *Human Work Interaction Design. Work Analysis and Interaction Design Methods for Pervasive and Smart Workplaces*. Abdelnour-Nocera, J et al. (Eds.), p. 127-140, Springer.
8. Burns, C.M. (2014). Using team cognitive work analysis as an approach for understanding teamwork in health care. *Cognitive Engineering in Medicine*. Bisantz, A., Burns, C.M., and Fairbanks, T. (Eds). CRC Press.
9. Burns, C.M. (2013). Cognitive work analysis: New dimensions. *Human Work Interaction Design*. Springer Lecture Notes in Computer Science: IFIP Advances in Information and Computer Technology. Campos, P. (Ed.). Springer.

10. Burns, C.M. (2013). Ecological Interface Design. *The Oxford Handbook of Cognitive Engineering*. Lee, J. and Kirlik, A. (Eds.). Oxford University Press.
11. Burns, C.M. and Bisantz, A.M. (2008). Advances in the Application of Cognitive Work Analysis. *Applications of Cognitive Work Analysis*. Bisantz, A. and Burns, C.M. (Eds.). Lawrence Erlbaum and Associates, Mahwah, NJ, p.1-14.
12. Burns, C.M., Enomoto*, Y., and Momtahan,K. (2008). A cognitive work analysis of cardiac care nurses performing teletriage. *Applications of Cognitive Work Analysis*. Bisantz, A. and Burns, C.M. (Eds.). Lawrence Erlbaum and Associates, Mahwah, NJ, p. 149-174.

Published Journal Papers

1. Shier*, A., Morita, P.P., Dickie, C., Islam, M., Burns, C.M., Cafazzo, J.A. (2018). Design and evaluation of safety-centered user interface for radiation therapy. *Practical Radiation Oncology*. Available online at <https://doi.org/10.1016/j.prro.2018.01.009>
2. Flohr, L., Beaudry, S., Johnson, K.T., West, N., Burns, C.M., Ansermino, M., Dumont, G., Wensley, D., Skippen, P., Gorges, M. (accepted). Clinician-driven design of VitalPAD – an intelligent monitoring and communication device to optimize patient safety in the Intensive Care Unit. *Journal of Translational Engineering in Health and Medicine*.
3. St. Maurice*, J. and Burns, C.M. (2017). Using cognitive work analysis to compare complex system domains. *Theoretical Issues in Ergonomics Science*. Available online at <https://doi.org/10.1080/1463922X.2017.1406556>
4. Jatoba, A., Bellas, H., Koster, I., Burns, C.M., Vidal, M.C.R., Carvalho, P.V.R. Grecco, C.H. (conditionally accepted). Supporting decision making in patient triage using a hierarchical fuzzy model. *Cognition Technology and Work*.
5. Minotra, D., Dain, S., and Burns, C.M. (2017). Usability testing and validation of ISO DIS 19223 for lung ventilators. *JMIR Research Protocols*.(Sep 08);6(9):e166.
6. Burns, C.M. (2017). Automation and the human factors race to catch up. *Journal of Cognitive Engineering and Decision Making*. Available online at <https://doi.org/10.1177/1555343417724975>
7. Jatoba*, A., Burns, C.M., Carvalho, Vidal, M.C.V., Amauri, P.V. (accepted). Contributions from cognitive engineering to requirements specifications for complex sociotechnical systems: A case study in the context of health care in Brazil. *Human Factors and Ergonomics in Manufacturing and Service Industries*.
8. St. Maurice*, J. and Burns, C.M. (2017). Modeling patient treatment with medical records: An abstraction hierarchy to understand competencies and needs. *JMIR Human Factors* 4(3):e16. [10.2196/humanfactors.6857](https://doi.org/10.2196/humanfactors.6857)
9. Li*, Y. and Burns, C.M. (2017). Modelling automation with Cognitive Work Analysis to support human-automation coordination. *Journal of Cognitive Engineering and Decision Making*. 11(4), 299-322. <https://doi.org/10.1177/1555343417709669>
10. St. Maurice*, J. and Burns, C.M. (2017). An exploratory case study to understand primary care users and their data quality tradeoffs. *Journal of Data and Information Quality* 8, 3-4, 24 pages. [10.1145/3058750](https://doi.org/10.1145/3058750)
11. McMurray, J., Grindrod, K.A., and Burns, C.M. (2017). How appropriate is all this data sharing? Building consensus around what we need to know about shared electronic health records in extended circles of care. *Healthcare quarterly* 4: 28-36.
12. Minotra*, D. and Burns, C.M. (2017). Understanding safe performance in rapidly evolving systems: A risk management analysis of the 2010 US stock market flash crash with Rasmussen's risk

- management framework. *Theoretical Issues in Ergonomics Science*. 18(6), 608-630.
10.1080/1463922X.2016.1254837
13. Sanderson, P., Burns, C.M. (2017). Rasmussen and the boundaries of empirical evaluation. *Applied Ergonomics*. 59, 649-656. <http://dx.doi.org/10.1016/j.apergo.2016.10.003>
 14. Jatoba*, A., Burns, C.M., Vidal, M.C.R., and de Carvalho, P.V.R. (2016). Designing for risk assessment in primary health care: a literature review. *JMIR Human Factors* 3(2):e21 Doi: [10.2196/humanfactors.5083](http://dx.doi.org/10.2196/humanfactors.5083)
 15. Burns, C.M. and Naikar, N. (2016). Prioritization: A double-edged sword? *Journal of Cognitive Engineering and Decision Making*, 10, 105-108., doi:10.1177/1555343416629180
 16. Jatoba*, A., Bellas, H.C., Bonfatti, R., Burns, C.M., Vidal, M.C.R., de Carvalho, P.V.R. (2015). Designing for patient risk assessment in primary health care: A case study for ergonomic work analysis. *Cognition Technology and Work*, 18:215-231. 10.1007/s10111-015-0355-x
 17. Arrabito, R., Ho, G., Aghaie*, B., Burns, C.M., Hou, M. (2015). Sustained attention in auditory and visual monitoring tasks: Effects of the administration of a rest break or vibrotactile signals on performance and workload. *Human Factors* 57(8), pp. 1403-1416. 10.1177/0018720815598433
 18. Mercer, K., Li, M., Giangregorio, L., Burns, C., Grindrod, K. (2015). A critical analysis of behavior change techniques present in wearable activity trackers. *Journal of Medical Internet Research MHealth and UHealth* 3(1) doi:10.2196/mhealth.4461
 19. Kant*, V., and Burns, C.M. (2015). Engaging nanotechnology: Ethnography of Lab-on-a-chip technology in small-scale fluidics research. *Cognition Technology and Work*.18(1), 33-52. DOI 10.1007/s10111-015-0344-0
 20. Mercer, K., Baskerville, B., Burns, C.M., Giangregorio, L., Rezai*, L., Grindrod, K. (2015). Using a participatory research approach to develop an interdisciplinary research agenda for the study of mobile health interventions for older adults. *Journal of Medical Internet Research: MHealth, Jan-Mar* 3(1):e11. doi: [10.2196/mhealth.3509](http://dx.doi.org/10.2196/mhealth.3509)
 21. Baskerville, N. B., Struik, L.L., Hammond, D., Norman, C.D., Guindon, E., Whittaker, R., Burns, C., Grindrod, K., Brown, S. (2015). Effect of a mobile phone intervention on quitting smoking in a young adult population of smokers: Randomized controlled trial study protocol. *Journal of Medical Internet Research: Protocols* 4(1), Jan-Mar, e:10. doi:10.2196/resprot.3823
 22. Minotra*, D, and Burns, C.M . (2015). Finding common ground: Situation awareness and cognitive work analysis. *Journal of Cognitive Engineering and Decision Making*, 9, 87-89.
 23. Ashoori*, M. Burns, C.M, Momtahan, K., d'Entremont, B. (2014). Using team cognitive work analysis to reveal healthcare team interactions in a labour and delivery unit. *Ergonomics* 57(4), 973-986. doi:10.1080/00140139.2014.909949
 24. Burns, C.M. (2013). Pathway to Innovation. *Industrial Biotechnology* 9 (5), 258-259.
 25. Morita*, P. and Burns, C.M. (2014). Trust tokens in team development. *Team Performance Management*. 20 (1), 39-64.
 26. St. Maurice*, J. and Burns, C.M. (2013). Finding Pavlov's doc: Behavioural insights towards better data in primary care. *Healthcare information management and communications Canada*. May 2013.
 27. Euerby*, A. and Burns, C.M. (2014). Improving social connection through a communities of practice inspired cognitive work analysis approach. *Human Factors* 56, 361-83.doi:10.1177/0018720813494410
 28. Nijhof*, N. van Gemert-Pijnen, J.E.W.C., Burns, C.M., and Seydel, E.R. (2013). Online personal assistant for dementia to stay safe at home and to reduce costs. *Gerontechnology* 11, 469-479. <http://dx.doi.org/10.4017/gt.2013.11.3.005.00>

29. Morita*, P. and Burns, C.M. (2014). Understanding “Interpersonal Trust” from a Human Factors perspective: Insights from Situation Awareness and the Lens Model. *Theoretical Issues in Ergonomics Science*, 15, 88-110. doi:10.1080/1463922X.2012.691184
30. Ashoori*, M. and Burns, C.M. (2013). Team Cognitive Work Analysis: Structure and tasks. *Journal of Cognitive Engineering and Decision Making* 7, 123-140.
31. Euerby*, A. and Burns, C.M. (2012). Designing for social engagement in online social networks using communities of practice theory and cognitive work analysis: A case study. *Journal of Cognitive Engineering and Decision Making* 6, 194-213. doi: 10.1177/1555343412440697
32. Davies*, T.C., Pinder, S.D., Dodd, G. and Burns, C.M. (2012). Where did that sound come from? Comparing the ability to localise using audification and audition. *Disability and Rehabilitation: Assistive Technology* 7 (2), 130–138.
33. Davies*, T.C., Pinder, S., and Burns, C.M. (2011). What’s that sound? Distance determination and aperture passage from ultrasound devices. *Disability and Rehabilitation: Assistive Technology* 6(6), 500-510.
34. Morita*, P.P., Burns, C.M. (2011). Situation awareness and risk management understanding notification issues. *Studies in Health Technology and Informatics* 164, 372-376.
35. Davies*, T.C., and Burns, C.M. (2008). Advances in cognitive work analysis and the design of ecological visual and auditory displays. *Cognitive Technology* 13 (2), 17-23.
36. Davies*, T.C., Pinder, S.D., Burns, C.M. (2008). Did you hear that? Ultrasound Doppler allows human echolocation by all. *New Zealand Acoustics, the Journal of the New Zealand Acoustical Society*.
37. Burns, C.M., Skraaning, G., Lau*, N., Jamieson, G., Kwok, J., Welch, R., Andresen, G.(2008). Evaluation of ecological interface design for nuclear process control: Situation awareness effects. *Human Factors* 50, 663-679.
38. Lau*, N., Skraaning, G., Jamieson, G., Burns, C. (2008). Ecological Interface Design in the nuclear domain: An empirical evaluation of ecological displays for the secondary subsystems of a boiling water reactor plant simulator. *IEEE Transactions on Nuclear Science*, 3597-3610.
39. Lau*, N., Veland, O., Kwok, J., Jamieson, G., Burns, C., Braseth, A., and Welch, R. (2008). Ecological interface design in the nuclear domain: An application to secondary subsystems of a boiling water reactor plant simulator. *IEEE Transactions on Nuclear Science*, 3579-3596.
40. Momtahan, K., Burns, C., Hyland, S., Jeon*, J., Gabriele, S. (2008). Using human factors and FMEA methods to evaluate labelling of injectable drugs. *Healthcare Quarterly special issue of Patient Safety Papers*, 11, 122-128.
41. Jessa*, M. and Burns, C. M (2007). Visual Sensitivities of Dynamic Graphical Displays. *International Journal of Human-Computer Studies* 65(3), 206-222.
42. Davies*, T. C., and Burns, C.M. (2006). Do you hear what I hear? Reflecting on auditory display in medicine. *Health Care and Informatics Review Online*. September 2006.
43. Burns, C. M. (2006). Towards proactive monitoring in the petrochemical industry. *Safety Science* 44, p. 27-36.
44. Burns, C. M. Asgary, A. & Levy, J. (2005). Operator support for ageing nuclear critical infrastructure systems: integrating ecological interface design with prospect theory. *International Journal of Critical Infrastructure*, Vol 1, No 4, p.299-311.
45. Burns, C. M., Bryant, D. B., and Chalmers, B.A. (2005). Boundary, purpose and values in work domain models: Models of naval command and control. *IEEE Transactions on Systems, Man and Cybernetics Part A* Vol 35, No 5, p.603-616.
46. Momtahan, K. Burns, C. M. (2004). Applications of Ecological Interface Design in supporting the nursing process. *Journal of Healthcare Information Management* 18(4), p. 74-82.

47. Burns, C. M. Bisantz, A.M. and Roth, E.M. (2004). Lessons from a comparison of work models: Representational choices and their implications. *Human Factors* 46(4), 711-727.
48. Burns, C. M., Kuo*, J., & Ng*, S. (2003). Ecological interface design: A new approach for visualizing network management. *Computer Networks*, 43, 369-388.
49. Burns, C. M., and Proulx*, P. (2002). Influencing social problems with interface design: A student project. *Ergonomics in Design*, 10(4), 12-16.
50. Burns, C.M., and Vicente, K.J. (2001). Model-based approaches for analyzing cognitive work: A comparison of abstraction hierarchy, multi-level flow modeling, and decision ladder modeling. *International Journal of Cognitive Ergonomics*, 5(3), 357-366.
51. Hajdukiewicz*, J. R., Vicente, K. J., Doyle, D. J., Milgram, P., & Burns, C. M. (2001). Modeling a medical environment: An ontology for integrated medical informatics design. *International Journal of Medical Informatics*, 62, 79-99, 2001.
52. Burns, C. M. (2000). Putting it all together: Improving integration in ecological displays. *Human Factors*, 42, p. 226-241.
53. Mumaw, R. J., Roth, E.M, Vicente, K.J., and Burns, C.M. (2000). There is more to monitoring a nuclear power plant than meets the eye. *Human Factors*, 42, pp. 36-55.
54. Burns, C.M. (2000). Navigation strategies with ecological displays. *International Journal of Human-Computer Studies*, 52, p.111-129.
55. Burns, C. M. and Vicente, K. J. (2000). A participant observation study of engineering design: How constraints drive design process. *Applied Ergonomics*, 31, p.73-82.
56. Vicente, K.J., Burns, C.M. and Pawlak*, W.S. (1998). Better handbooks: better design, *Ergonomics in Design*, 6, p. 21-27.
57. Burns, C.M., Vicente, K.J., Christoffersen*, K. and Pawlak*, W.S. (1998). Towards viable, useful, and usable human factors design guidance. *Applied Ergonomics*, 33, p. 311-322.
58. Vicente, K.J., Burns, C.M. and Pawlak, W.S. (1997). Muddling through wicked design problems. *Ergonomics in Design*, 5, p. 25-30.
59. Vicente, K.J. and Burns, C.M. (1996). Evidence for direct perception from cognition in the wild. *Ecological Psychology*, 8, p. 269-280.
60. Burns, C.M. and Vicente, K.J. (1996). Judgements about the value and cost of human factors information in design. *Information Processing and Management*, 32, p. 259-271.
61. Jatoba*, A., Bellas, H., Burns, C.M., Grecco, C., Vidal, M.C.R., Carvalho, P.V. (in review). Supporting decision making in patient risk assessment using a hierarchical fuzzy model. *Operational Research*.
62. Sadat Rezai*, L, and Burns, C.M. (under revision). Investigating a message tailoring strategy to improve efficacy of activity promotion interventions: A study protocol. *JMIR Research Protocols*.
63. Arrabito, G.R., Ho, G., Li*, Y., Giang*, W., Burns, C.M., Hou, M. (submitted). Supervisory control of an unmanned aircraft system: Evaluation of sonification and tactification for encoding urgency of system health status. *Journal of Experimental Psychology: Applied*.
64. St. Maurice*, J., and Burns, C.M. (in revision). Using persuasive design to improve data-entry behaviour in primary care. *Journal of Medical Internet Research*.
65. Mercer, K., Burns, C., Guirguis, L., Chin, J., Dogba, J., Dolovich, L., Guenette, L., Jenkins, L., Legare, F., McKinnon, A., McMurray, J., Waked, K., Grindrod, K. (submitted). Playing telephone: Understanding the state of medication decision making in growing healthcare teams in the time of electronic health records. *Journal of Medical Internet Research*.

Fully Refereed Conference Publications

1. Burns, C.M., Sadat Rezaei*, L., and St. Maurice, J. (2018). Understanding the context for health behavior change with Cognitive Work Analysis and Persuasive Design. *Hawaii International Conference for Systems Sciences*, 2876-2883.
2. Villacis, C., Navaette, M., Rodriguez, I., Romero, F., Escobar, L., Fuertes, W., Chamorro, S., Benavides, R., Zambrano, M., Burns, C.M. (2017). Real-time flight simulator construction with a network for training pilots using mechatronics and cyber-physical system approaches. *IEEE International Conference on Power, Control, Signals and Instrumentation Engineering*.
3. Dikmen*, M., Burns, C.M. (2017). Trust in autonomous vehicles: The case of Tesla Autopilot and Summon. *2017 IEEE International Conference on Systems, Man and Cybernetics*. 1093-1098. [10.1109/SMC.2017.8122757](https://doi.org/10.1109/SMC.2017.8122757)
4. Li*, Y., Wang, X., and Burns, C.M. (2017). Ecological Interface Design for financial trading: Trading performance and risk preference effects. *2017 IEEE International Conference on Systems, Man and Cybernetics*. 600-605. [10.1109/SMC.2017.8122672](https://doi.org/10.1109/SMC.2017.8122672)
5. Dikmen*, M., and Burns, C.M. (2016). Autonomous driving in the real world: Experiences with Tesla Autopilot and Summon. *8th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*, 225-228.
6. Li*, Y., Hu, R., Burns, C.M. (2016). Representing stages and levels of automation on the decision ladder: The case of automated financial trading. *Proceedings the 2016 Annual meeting of the Human Factors and Ergonomics Society*. 328-333.
7. Minotra*, D., Burns, C.M., McNeese, M. (2015). Guidelines and caveats for manipulating expectancies in experiments involving human participants. *The 59th Annual Meeting of the Human Factors and Ergonomics Society*, 56(1), 1778-1782.
8. Li*, Y., Burns, C.M., Hu, R. (2015). Understanding automated financial trading using work domain analysis. *The 59th Annual Meeting of the Human Factors and Ergonomics Society*, 56(1), 165-169.
9. Abdelnour-Nocera, J., Oussena, S., Burns, C.M. (2015). Human work interaction design of the smart university. *Human Work Interaction Design 2015*. London, UK. June 25-26, 2015.
10. Li*, Y. and Burns, C.M. (2013). Perceived urgency of tactile warnings. *SMC 2013: The International Conference on Systems, Man and Cybernetics*, 530-535.
11. Gorges, M., Morita*, P.P., Burns, C.M., Ansermino, M. (2013). Mobile Patient Monitoring for the Pediatric Intensive Care Unit - Work Domain Analysis and Rapid Prototyping Results. *SMC 2013: The International Conference on Systems, Man and Cybernetics*, 3765-3770.
12. Horiguchi, Y., Burns, C., Nakanishi, Sawaragi, T. (2013). Visualization of control structure in human-automation system based on cognitive work analysis. *The 12th IFAC/IFIP/IFORS/IEA Symposium on Analysis, Design, and Evaluation of Human-Machine Systems*, 423-430.
13. Arrabito, R., Ho, G., Li*, Y., Giang*, W., Burns, C., Hou, M., and Pace, P. (2013). Multimodal displays for enhancing performance in a supervisory monitoring task. *Proceedings of the 57th Annual Meeting of the Human Factors and Ergonomics Society*, 1164-1168.
14. Roth, E.M., Kilgore, R., Burns, C.M., Wears, R.L., Lee, J.D., Jamieson, G., Bisantz, A, (2013). Cognitive engineering across domains: What the wide-angle view can provide. *Proceedings of the 57th Annual Meeting of the Human Factors and Ergonomics Society*, 139-143.
15. Ho*, A. and Burns, C.M. (2013). Music as an auditory display: Interaction effects of mode and tempo on perceived urgency. *Proceedings of the 57th Annual Meeting of the Human Factors and Ergonomics Society*, 1149-1153.
16. Morita*, P. and Burns, C.M. (2013). Designing for interpersonal trust – the power of trust tokens. *Proceedings of the 57th Annual Meeting of the Human Factors and Ergonomics Society*, 339-343.

17. Robinson*, T. and Burns, C.M. (2013). Focused learning: Control of cognitive load in instructional material for a computer algebra system. *Proceedings of the 57th Annual Meeting of the Human Factors and Ergonomics Society*, 472-476.
18. Pannathur, P., Bisantz, A. Burns, C.M., Elm, W., Lee, J., Pfautz, J. (2013). Bridging the gap between cognitive systems engineering analysis, design and practice. *Proceedings of the 57th Annual Meeting of the Human Factors and Ergonomics Society*. 334-338.
19. Morrison, J.G., Feigh, K.M., Smallman, H.S., Burns, C.M., Moore, K. (2013). The quest for anticipatory decision support systems. *Proceedings of the 57th Annual Meeting of the Human Factors and Ergonomics Society*. San Diego, CA. October 1-4, 2013.
20. Arrabito, G.R., Ho, G., Burns, C.M., Pace, P., and Hou, M. (2012). The efficacy of multimodal displays for enhancing supervisory control of UAV automated landing: Preliminary findings. *Unmanned Systems Canada*. Ottawa, Canada. November 7-9, 2012.
21. Horiguchi, Y., Burns, C., Nakanishi, Sawaragi, T. (2012). A cognitive work analysis of hot strip mill operation: Modeling functional structure of a highly automated process. *2012 IFAC workshop on automation in the mining, mineral, and metal industries*, 208-213.
22. Giang*, W. and Burns, C.M. (2012). Sonification discriminability and perceived urgency. *Proceedings of the 56th Annual Meeting of the Human Factors and Ergonomics Society*. Boston, MA. October 22-26, 2012.
23. Horiguchi, Y., Burns, C. M., Nakanishi, H., Sawaragi, T. (2011). Cognitive Work Analysis of Production Process with Automation. *Proceedings of the 12nd SICE System Integration Division Annual Conference (SI2011)*, December. 23-35, 2011, 1403-1406 (in Japanese).
24. Ashoori*, M., Momtahan, K., and Burns, C.M. (2011). Control task analysis in action: Collaboration in the operating room. *55th Annual Meeting of the Human Factors and Ergonomics Society*, Las Vegas, NV. 272-276.
25. Giang*, W., Masnavi*, E., and Burns, C.M. (2011). Perceptions of temporal synchrony in multimodal displays. *55th Annual Meeting of the Human Factors and Ergonomics Society*, Las Vegas, NV. 1165-1169.
26. Burns, C.M., Ho, G. and Arrabito, R. (2011). Mapping ecologically to modalities. *55th Annual Meeting of the Human Factors and Ergonomics Society*, Las Vegas, NV. 335-339.
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Abstract Refereed Conference Publications

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2. Chin*, J., Li*, Y., Burns, C. (2018). User perspectives of conversational agents across lifespan: Being assistive, but not too smart. Poster presented at the *Cognitive Aging Conference 2018*, Atlanta, GA.
3. Flohr, L., Beaudry, S., Ansermino, M., Wensley, D., Skippen, P., Burns, C., Gorges, M. (2017). Observing pediatric intensive care unit clinicians to establish requirements for VitalPAD, a mobile

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5. Grindrod, K., Burns, C., Guirguis, L., Abidi, S., Borsema, J., Chabot, C., Chin*, J., Dogba, J., Guenette, L., Legare, F., Mercer, K., McKinnon, A., Waked, K. (2017). Playing telephone: Understanding the state of medication decision making in growing healthcare teams in the time of electronic health records. *CAHSR: Canadian Association for Health Services and Policy Research*. May 24-26, 2017. Toronto, ON.
6. Sadat Rezai, L., Chin*, J., Bassett-Gunter, R., Burns, C.M. (2017). Investigating efficacy of regulatory fit theory in design of persuasive systems that promote physical activity. In R. Orji, M. Reisinger, M. Busch, A. Dijkstra, M. Kaptein, E. Mattheiss (eds.): *Proceedings of the Personalization in Persuasive Technology Workshop, Persuasive Technology 2017, Amsterdam, The Netherlands, April 3-6, 21-25*.
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45. Dikmen*, M. and Burns, C.M. (submitted). Behavior change in an algorithmically filtered world. Submitted to the doctoral consortium of *Persuasive Technology*.

Standards and Guidelines

Note: These were later published as books by the ASM Consortium. The change in authorship reflected contributions to older versions of the guidelines.

1. Burns, C., Hajdukiewicz, J., ASM Displays Subcommittee (2006). *ASM Consortium Guidelines: Effective operator display design*. Version 5. Abnormal Situation Management Joint R&D Consortium, Minneapolis, MN, 211pgs.
2. Burns, C., Hajdukiewicz, J.(2006). *ASM Consortium Guidelines: Effective alarm management practices* Version 4. Abnormal Situation Management Joint R&D Consortium, Minneapolis, MN, 134pgs.
3. Burns, C., Hajdukiewicz, J. (2007). *ASM Consortium Guidelines: Effective procedural practices*, Version 1.5. Abnormal Situation Management Joint R&D Consortium, Minneapolis, MN, 131pgs.

Research Project Final Reports

1. Li*, Y., Lien*, S., Rizvi*, S., and Burns, C.M. (2013). *Baseline and multimodal GCS interface design Part 4*. (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-08).
2. Li*, Y. and Burns, C.M. (2013). *Baseline and multimodal GCS interface design Part 3*. (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-07).
3. Aghaie*, B., Ho*, A., and Burns, C.M. (2012). Use of Vibrotactile Stimulation for Sustaining Attention of UAV Operators: Project Update. (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-06).
4. Giang*, W., Li*, Y., and Burns, C.M. (2012). *Baseline and multimodal GCS interface design Part 2*. (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-05).
5. Coates, C. and Burns, C.M. (2011). *Risk mitigation in capital acquisition: Modeling and simulation approaches*. Task No. 001: Task survey of the Canadian Forces acquisition. (Final Report PWGSC Contract No. w7719/115018/001/TOR). September 30, 2011. 58 pages.
6. Giang*, W., Masnavi*, E., Rizvi*, S., Burns, C.M. (2011) *Baseline and multimodal GCS interface Design*. (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-03).
7. Aghaie*, B., Burns, C.M. and Morita*, P. (2011) *Use of vibrotactile stimulation for sustaining attention of UAV operators*. (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-04). (in review)
8. Morita*, P., Chui*, F., Burns, C. (2010). *Preliminary Review of Psychophysiological Technologies to Support Multimodal UAV Interface Design*. (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-02). June 30, 2010.
9. Giang*, W., Santhakumaran*, S., Masnavi*, E., Glusich*, D., Kline*, J., Chui*, F., Burns, C., Histon, J., and Zelek, J. (2010). *Multimodal interfaces: Literature review of ecological interface design*,

- multimodal perception and attention, and intelligent adaptive multimodal interfaces.* (Final Report PWGSC Contract No. w7711-098148/001/TOR Call-up: 8148-01). June 30, 2010.
10. Momtahan, K., Burns, Catherine M., Hyland, S., Karns, S.A.(2008). Using human factors and FMEA methods to evaluate labelling of injectable drugs. Report to the Canadian Patient Safety Institute. January 31, 2008. 10.13140/2.1.1955.4562
 11. Lau*, N., Skraaning, G., Jamieson, G., Burns, C.M. (2008). *The impact of ecological displays on operators task performance and workload.* OECD Halden Reactor Project (HWR-888). OECD: Halden, Norway, February 2008. (available to Halden program members only).
 12. Skraaning jr., G., Lau*, N., Welch, R., Nihlwing, C., Andresen, G., Brevig, L.H., Veland, O., Jamieson, G., Burns, C., Kwok*, J. (2007). *The Ecological Interface Design Experiment (2005).* OECD Halden Reactor Project (HWR-833). OECD:Halden, Norway. March 2007. (available to Halden program members only).
 13. Welch, R. Braseth, A.O., Nihlwing, C., Skraaning Jr., G., Teigen, A., Veland, O., Lau*, N., Jamieson, G.A., Burns, C.M., Kwok*, J.. (2007). *The 2005 Ecological Interface Design Process and the resulting displays.* OECD Halden Reactor Project (HWR-847). OECD:Halden, Norway. March 2007. (available to Halden program members only)
 14. Garrison, L., Burns, C., Christoffersen, K., Chen-Wing, S., Dinadis, N., Hajdukiewicz, J., Kuo, J., Reising, D. (2002) *DCS Graphical User Interface Design: Work Domain and Task Analysis Results*(Report number TBD). Ft. McMurray, AB: Syncrude UE-1, Process Automation, June 21, 2002.
 15. Burns, C. M., Greenley, M., Roth, E., Barone, A., and Brooks, J. (2001). *Literature survey for collaborative displays: Phase 2 report.* (Final Report PWGSC Contract No. W7711-997593/001). Toronto, Ontario: Defence and Civil Institute for Environmental Medicine. August, 2001.
 16. Burns, C. M., Greenley, M., Roth, E., Barone, A., and Brooks, J. (2001), *Literature survey for collaborative displays: Phase 1 report.* (Report PWGSC Contract No. W7711-997593/001). Toronto, Ontario: Defence and Civil Institute for Environmental Medicine. January, 2001.
 17. Burns, C. M., & Bryant, D. J. (2000), Feasibility Study of Cognitive Work Analysis for Command and Control Work Environment of a HALIFAX Class Ship: CWA Feasibility Assessment and Future Work, (Final Summary Report PWGSC Contract No. W7701-8-1427/001/XSK). Valcartier, Quebec: Defense Research Establishment Valcartier, 2000.
 18. Bryant, D. J., & Burns, C. M.(2000). Feasibility Study of Cognitive Work Analysis for Command and Control Work Environment of a HALIFAX Class Ship: Work Domain Review of the TADMUS Decision Support System, (Final Contract Report PWGSC Contract No. W7701-8-1427/001/XSK). Valcartier, Quebec: Defense Research Establishment Valcartier, 2000.
 19. Burns, C. M., & Bryant, D. J.(2000). Feasibility Study of Cognitive Work Analysis for Command and Control Work Environment of a HALIFAX Class Ship: Work Domain Models, (Final Contract Report PWGSC Contract No. W7701-8-1427/001/XSK). Valcartier, Quebec: Defense Research Establishment, Valcartier, 2000.
 20. Burns, C. M., & Bryant, D. J.(2000). Feasibility Study of Cognitive Work Analysis for Command and Control Work Environment of a HALIFAX Class Ship: Validation of Models (Final Contract Report PWGSC Contract No. W7701-8-1427/001/XSK). Valcartier, Quebec: Defense Research Establishment Valcartier, 2000.
 21. Burns, C. M., & Bryant, D. J. (2000). Feasibility Study of Cognitive Work Analysis for Command and Control Work Environment of a HALIFAX Class Ship: Background and Methodology, (Final Contract Report PWGSC Contract No. W7701-8-1427/001/XSK). Valcartier, Canada: Defense Research Establishment Valcartier, 2000.

22. Mumaw, R.J., Roth, E.M., Vicente, K.J. and Burns, C.M.(1996). *A model of operator cognition and performance during monitoring in normal operations*, Pittsburgh, PA: Westinghouse Science and Technology Center, 1996.
23. Mumaw, R.J., Roth, E.M., Vicente, K.J. and Burns, C.M.(1995). *Cognitive contributions to operator monitoring during normal operations*, (AECB Project No.2.376.1), Ottawa, Canada: Atomic Energy Control Board, 1995.
24. Burns, C.M. and Vicente, K.J.(1994). *Human Factors Design Guidance: Matching the Advice to Designers' Questions*, (XSE93-00010-(303)), DCIEM, Canada, 1994.
25. Webb, R.D.G., Matthews, M.L., Greenley, M.P. and Burns, C.M. (1993). *Survey of evaluation methods for command and control systems*, (Contract #W7711-2-7178/01-XSE), DCIEM, Canada, 1993.

Lab Technical Reports

1. Ho, D. and Burns, C.M. (2003). *An EID approach to examining TCAS 2 automation*. HSSD 03-02. Human Systems Technical Report. Department of Systems Design Engineering.
2. Barsalou, E. and Burns, C.M. (2003). *Examining the process of automation: The ecology of automation development*. HSSD 03-01. Human Systems Technical Report. Department of Systems Design Engineering.
3. Mekdeci, B. and Burns, C.M. (2003). *Preliminary work domain analysis of an armoured fighting vehicle*. HSSD 03-03. Human Systems Technical Report. Department of Systems Design Engineering.
4. Zhou, S. and Burns, C.M. (2003). *A methodology for integrating cognitive engineering into database system analysis and design*. HSSD 03-04. Human Systems Technical Report. Department of Systems Design Engineering.
5. Garabet, A. (2003). *Examining collaboration with ecological interface design*. HSSD 03-05. Human Systems Technical Report. Department of Systems Design Engineering.
6. Moradi-Nadimian, R. (2003). *Using ecological interface design to enhance a 'Highway in the Sky' display*. HSSD 03-06. Human Systems Technical Report. Department of Systems Design Engineering.
7. St-Cyr*, O. (2002). *An ecological approach to mental models: Towards assessing ecological compatibility*. (HSSD-02-01). Waterloo, Canada: Department of Systems Design Engineering, University of Waterloo. Project Supervisor: C. Burns
8. Griffiths*, S. A., Thompson*, L. K., and Burns, C. (2001). *Work domain analysis for an aircraft system*. (HSSD-0102). Waterloo, Canada: Department of Systems Design Engineering, University of Waterloo.
9. Kuo*, J.(2001). *Applying ecological interface design to network performance management*. (HSSD 01-01). Waterloo, Canada: Department of Systems Design Engineering, University of Waterloo. Project Supervisor: C. Burns
10. Thompson*, L. K., and Burns, C.(2000). *Navigation strategies with integrated power plant displays*. (HSSD-00-05). Waterloo, Canada: Department of Systems Design Engineering, University of Waterloo.
11. Wong*, J., Walji*, A., Bringelson, L., and Burns, C. M. (2000). *Searching for information on interface design for network management: Literature review and survey of network managers*. (HSSD-00-04) Waterloo, Canada, Department of Systems Design Engineering, University of Waterloo.
12. Proulx*, P. (2000). *On-line casino interface for safe gambling*, (HSSD-00-03) Waterloo, Canada, Department of Systems Design Engineering, University of Waterloo. Project Supervisor: C. Burns.

13. Kuo*, J. and Burns, C. M. (2000). *Applying Ecological Interface Design to network performance management: A progress report.* (HSSD-00-02) Waterloo, Canada, Department of Systems Design Engineering, University of Waterloo, 2000.
14. Proulx*, P. and Burns, C. M. (2000). *A review of eye-tracking and a project proposal for an application of it in interface design,* (HSSD-00-01) Waterloo, Canada, Department of Systems Design Engineering, University of Waterloo.
15. Kuo*, J. and Burns, C. M. (1999). *Work domain analysis for virtual private networks.* (HSSD-99-02), Waterloo, Canada, Department of Systems Design Engineering, University of Waterloo.
16. Barsalou*, E. and Handler*, C. (1999). *Ecological interface design: Applying the abstraction hierarchy to the computing networks domain,* (HSSD-99-01), Waterloo, Canada: Department of Systems Design Engineering, University of Waterloo. Project Supervisor: C. Burns.
17. Burns, C. M. (1998). The effects of spatial and temporal proximity of means-end related information in ecological display design for an industrial simulation. (CEL 98-05), Cognitive Engineering Laboratory, University of Toronto.
18. Burns, C.M. and Vicente, K.J. (1997). *A Comprehensive Experimental Evaluation of Functional Displays in Process Control.* (CEL 97-05), Cognitive Engineering Laboratory, University of Toronto.
19. Burns, C.M. and Vicente, K.J. (1996). *An Experimental Evaluation of Functional Displays in Process Supervision and Control.* (CEL 96-09), Toronto, Canada: Cognitive Engineering Laboratory, University of Toronto.
20. Vicente, K.J. and Burns, C.M. (1995). *A field study of operator cognitive monitoring at Pickering Nuclear Generating Station-B.* Cognitive Engineering Laboratory, University of Toronto.
21. Burns, C.M. and Vicente, K.J. (1995). *Physical and functional displays in process supervision and control.* (CEL 95-11), Toronto, Canada: Cognitive Engineering Laboratory, University of Toronto for ABB Corporate Research, Heidelberg.
22. Burns, C.M. (1994). *Muddling through wicked problems: Exploring the role of human factors information in design.* (CEL 94-02), Cognitive Engineering Laboratory, University of Toronto.
23. Vicente, K.J., Burns, C.M. and Pawlak*, W.S. (1993). *Egg-sucking, mousetraps, and the tower of Babel: Making human factors guidance more accessible to designers.* (CEL 93-01), Cognitive Engineering Laboratory, University of Toronto.

Other Publications

1. Vicente, K.J. and Burns, C.M., (1993) Overcoming the conceptual muddle: A little help from systems theory, *Cognoscenti: Bulletin of the Toronto Cognitive Science Society*, vol.1, pp. 16-18.
2. Burns, C.M. (2004) Cognitive engineering research at the University of Waterloo. *Cognitia*, 1.
3. Kaber, D. and Burns, C.M. (2005) Review of the CEDM-TG program at the 48th Annual Meeting and the Road to Orlando, *Cognitia* 2.

Other Scholarly Contributions

1. UOHI Teleform (Giang, Enomoto, Chen, Ho, Pajek, Momtahan, Caves, Burns)
2. UOHI Nursing Profile (Giang, Enomoto, Chen, Ho, Pajek, Momtahan, Caves, Burns)
3. Constraint-based AFV simulator (Mekdeci, Burns with Greenley partnership)
4. EID Mobile Toolkit (Grant, Hickson, Thompson, Burns, with BUL partnership)
5. Diabetes Pro (Grant Hickson Thompson Burns with BUL partnership)

6. EID Object Library (Garrison, Dinadis, Burns, Kuo, Chen-Wing, Christofferson - license held by ProSum Solutions)
7. Object Library for Responsible Gaming (Proulx, Burns)
8. Rhediant (Burns, Williams, Chow) <http://www.aidl.uwaterloo.ca/RHEDIANT/index.html>

PRESENTATIONS

Keynote Presentations

- 2016 Grand River Hospital Care of the Elderly Day, Waterloo, ON.
- 2015 Second African Symposium on Human Factors and Aviation Safety, Capetown, SA.
- 2014 IBM Centre for Advanced Studies (CASCON 2014). Markham, ON.
- 2012 Human Work Interaction Design. Copenhagen, Denmark.
- 2012 Unmanned Systems Canada (Human Factors Track). Ottawa, ON.
- 2007 Canadian Council for Occupational Health and Safety Annual Forum Vancouver, BC.
- 2003 Achema 2003, Frankfurt, Germany.

Invited Talks

- 2017 Fluxible Brown Bag Talk
- 2016 SUNY Buffalo, Buffalo, NY.
- 2016 Texas A&M University, College Station, TX.
- 2015 Society for Technology in Anesthesia Annual Meeting, Phoenix, AZ.
- 2014 Vanderbilt University Medical Centre Grand Rounds, Nashville, TN.
- 2013 BioJapan, Yokohama, Japan.
- 2013 Genomics Institute, A*STAR, Singapore.
- 2013 Intent to Invent, Event of the iGEMS student team.
- 2013 Kyoto University, Kyoto, Japan.
- 2011 GE Global Energy Research Centre, Schenectady, NY.
- 2009 Tsinghua University, Beijing, China.
- 2009 Xi'an Jiaotong University, Xi'an, China
- 2008 University of Memphis, TN.
- 2008 Ottawa Hospital, Clinical Grand Rounds, Ottawa, ON.
- 2008 Carleton University, Ottawa ON.
- 2008 University of Toronto, Toronto, ON.
- 2007 DRDC Toronto, ON.
- 2007 University of Queensland, Australia.
- 2007 DSTO, Melbourne, Australia.
- 2007 Maplesoft, Waterloo, ON.
- 2006 ASM Consortium, Phoenix, AZ.
- 2006 McMaster University, Hamilton, ON.
- 2006 Cognitive Systems Engineering Consortium (online).
- 2006 Research in Motion, Waterloo, ON.
- 2005 Halden Man Machine Technology Group, Halden, Norway.
- 2005 Forsmark Nuclear Plant, Forsmark, Sweden.

- 2005 Information Technology Group, Espoo, Finland.
2005 CMC Electronics, Ottawa, ON.

Conference Presentations without Proceedings

- 2006 Momtahan, K., Burns, C., Sherrard, H., Mesana, T., Labinaz, M. (2006). The CARDIO Project: Cardiac Algorithms Research and Development in Operation. *The 16th World Congress of the World Society of Cardio-Thoracic Surgeons*. Ottawa, Canada. August 17-20.
- 2006 Momtahan, K., Burns, C., Sherrard, H., Mesana, T., Labinaz, M. (2006). The CARDIO Project: Cardiac Algorithms Research and Development in Operation. *The 16th World Congress of the World Society of Cardio-Thoracic Surgeons*. Ottawa, Canada. August 17-20.
- 2006 Momtahan K, Burns C, Sherrard H, Labinaz, M, Mesana T, Caves W (2006). Development and Evaluation of a Decision Support Tool to Manage Calls from Cardiac Patients Experiencing Chest Pain. *The Canadian Cardiovascular Society Conference*, Vancouver, October 22 – 24.
- 2006 Momtahan K, Burns C, Sherrard H, Labinaz, M, Mesana T, Enomoto Y, Ho V, Caves W, Giang W, Pajek D, Saunders (2006). Personal Digital Assistants and Decision Support Software: New Mechanisms to Improve Access to Cardiac Care Best Practices. Oral presentation at *eHealth*, Victoria, BC, April 30 – May 3.
- 2006 Momtahan K, Burns C, Sherrard H, Labinaz, M, Mesana T, Enomoto Y, Ho V, Caves W, Giang W, Pajek D, Saunders (2006). The CARDIO Project (Cardiac Algorithms Research and Development in Operation). Poster presentation at *the Ontario Ministry of Health and Long-Term Care Celebrating Innovations in Health Care Expo*, Toronto, April 19 – 20.
- 2005 Momtahan K, Burns C, Sherrard H, Labinaz, M, Mesana T, Enomoto Y, Ho V, Caves W, Giang W, Pajek D, Saunders (2005). Decision support tools for nurse practitioners. Poster presentation at the *Ontario Nurse Practitioners conference*, Toronto, November 11 – 12.

Technical Workshops

- 2000 Hajdukiewicz, J. R., Burns, C. M. (2000) Human-Computer Interface Design for Complex Systems. Workshop presented at the IEA2000/HFES 2000 Congress.

RESEARCH FUNDING

Years	Source/Role	Project	Amount (total)
2017-2022	NCE/co-PI	Canadian Frailty Network	\$2, 557, 818 \$3, 050, 130 (ink)
2017-2019	Sorbonne Universities Forminnov/co-app	Innovation dans la formation et l'entrepreneuriat en génie biomédical	\$130, 000 EUR
2017-2019	DRDC Toronto/PI	Navy crew automation	\$119, 999
2017-2020	NSERC CRD/PI	Improving work coordination through context	\$237, 738
2016-2019	NSERC CRD/co-I	Development of a prototype lower limb active compression device	\$304, 366
2016	CIHR Project Scheme (Gorges PI)/coI	VITALPAD: Patient care in the intensive care unit	\$100, 000
2016-2017	International Research Partnership/PI	International Partnership grant with Sorbonne Universities	\$54, 470
2015-2015	International Research Partnership Grant/PI	International Partnership grant with Twente	\$55, 000
2015-2016	CIHR (Grindrod)/co-PI	Playing telephone: Exploring the potential for interdisciplinary shared decision making for medication therapy in shared electronic health records	\$121, 237
2015-2017	TELUS (Grindrod)/co-PI	Value and Opportunity in the Pharmaceutical Space	\$450, 000
2015	Mitacs Accelerate Cluster/co-I	Bridging the Gap – Health and Safety Engineering Teaching Modules Stage 2 Intern: Murat Dikmen	\$10, 000
2015	NSERC Ontario Workshop Grant	UW-Bristol Nano-technology Workshop	\$10, 000
2015	International Research Partnership Grant/co-PI	UW-Bristol Nano-technology Workshop	\$20, 000
2015	Mitacs (with Scott and Randall)/co-I	Intern support for Daniel Varona-Marin for work with SMART Technologies	\$30, 000
2015-2018	Science Without Borders/named collaborators	Visiting Scholar at Federal University of Rio de Janeiro	\$7000 in honorarium 3 trips per year to Brazil \$25, 000 in research funding to the joint team 36 months of PhD support

			36 months of post-doctoral support
2015	IBM CASCON/PI	Web tasking usability	\$20, 000
2015-2019	NSERC Strategic Project (Czarnecki and 8 others)/co-I	The Upgradeable Car	\$433, 000
2014-2015	NSERC Engage/PI	Assisting workflow in biomanufacturing with data visualizations	\$25, 000
2015-2021	NSERC CREATE (Czarnecki and 10 others)/co-I	NSERC CREATE in Product Line Engineering for Cyberphysical Systems	\$1, 350, 000
2014-2015	CIHR (with Grindrod and 2 others)/co-PI	Semantic interoperability of exchanged information on a regional electronic health record that is used by an expanded circle of care which includes social supports and community services	\$10, 000
2013-2018	NSERC Discovery Grant/PI	Understanding adaptive interfaces	\$140, 000
2012-2016	Lockheed Martin (with Safavi-Naieni, Peterson, Hughson and Saleghian)/PI	Second Heart (contract)	\$1, 100, 000
2013-2015	NSERC CRD with Embium/PI	Advanced financial market visualization to improve decision making	\$1, 104, 840
2013-2015	CIHR (with Baskerville and 2 others)/co-app	Effect of a smartphone application on quitting smoking	\$350, 000
2012-2014	NSERC CRD/Cardon (with Kulic)/co-app	Automated rehabilitation system for knee and hip rehabilitation	\$420, 875
2013-2014	OCE match with Embium/PI	Advanced financial market visualization to improve decision making	\$135, 000
2013	Oculys/Fed Dev Arc (with Ponnambalam)/co-PI	Design of an interface for wait time prediction	\$50, 000
2013	Medtronic/NSERC Engage/PI	Designing for engagement in home health care technology	\$25, 000
2013	Propel Seed Grant (with Grindrod and 6 others)/co-app	Creating an interdisciplinary team to assess the care and research applications of mobile health among seniors	\$10, 000
2012	Communitech/Mitacs/PI	Design guidance for novice designers	\$15, 000
2012	RIM/NSERC Engage/PI	Exploring a mobile device interface that adapts its look and functionality to user state as measured by a biosensor	\$25, 000
2012	Agfa/NSERC Engage/PI	Ecological interface design for imaging system configuration and management	\$25, 000
2010-2012	DRDC/PI	Advanced Interfaces	\$600, 000
2008-2012	NSERC Discovery Grant/PI	Cognitive work analysis for teams	\$130,000

2011	Cyborg Trading Systems/Mitacs/PI	Visualization of high frequency financial data	\$15, 000
2009-2011	NSERC Discovery Accelerator Supplement/PI	Cognitive work analysis for teams	\$40, 000
2009-2011	Bristol-Myers Squibb/PI	Design of a tool for Rheumatology	\$48, 000
2008-2011	Maplesoft, Inc./PI	NSERC IPS Support for Tom Robinson	\$30, 000
2010	Dreamcube/Rogers/Precarn/PI	Design of the UI remote	\$60, 000
2010	Allerta/MITACS/PI	2nd Generation Smartwatch Concept Development and Evaluation	\$15, 000
2009	Allerta/OCE/PI	Design of a single button interface	\$22, 000
2003-2007	NSERC Discovery Grant/PI	Support structure for EID	\$84, 000
2006	Canadian Patient Safety Institute/ co-PI (with Momtahan)	Safer labeling of injectable drugs	\$44, 000
2004-2006	NSERC Special Research Opportunity/co-PI (with Jamieson)	EID for nuclear power plant simulation	\$172, 335
2004-2006	Halden Man Machine lab/co-PI (with Jamieson)	Facility access and integration support	\$650, 000
2004-2006	Ontario Ministry of Health/co-PI (with Momtahan)	Using Personal Digital Assistants and Patient Care Algorithms to Improve Access to Cardiac Care Best Practices	\$242, 000
2004	Alumni donations	Special projects	\$500
2004	CFI infrastructure in kind/co-app (with Jamieson)	Process control workstation	\$440, 000
2004	RIM in-kind support/PI	Enterprise software for health monitoring	\$17, 000
2004	CAE in kind software donation/PI	STRIVE for behavioural modeling	\$70, 000
2003-2004	Bell University Labs/PI	EID for health monitoring	\$150, 000
2003-2004	Greenley and Associates/PI	WDA for behavioural modeling	\$11, 000
2001-2004	CRESTech/PI	Ecological Interface design for aviation	\$140, 568
2001-2004	NRC Flight Research Lab/PI	In kind support for EID for aviation	\$67, 500
1999-2003	NSERC Operating Grant/PI	Interface Integration for Large Scale Systems	\$72, 240
1999-2001	CITO/PI 40/60 With T. Carey, CS	Co-operative knowledge building with user-centered design	\$220, 470
1999	Nortel/PI 80/20 with T. Carey, CS	Ecological Interface Design for Network Management	\$20,000
1999	NSERC Equipment Grant/PI	Equipment for Interface Integration for Large Scale Systems	\$36,200

1999	RA Support Program for New Faculty/PI	An Investigation of Interface Design for Network Management	\$6, 750
1998-1999	University of Waterloo/PI	Start-up Grant	\$30, 000
		TOTAL FUNDING:	\$9, 455, 985

POSITIONS

External Positions

- 2018 Member, Canadian Health Care Human Factors Consortium
2018 Advisory Board, CommerceLab, Stratford, ON
- 2017 Member, Canadian Health Care Human Factors Consortium
2017 Advisory Board, CommerceLab, Stratford, ON
- 2016 Advisory Board, CommerceLab, Stratford, ON
2016 Member, e-Health Centre of Excellence Strategic Planning Focus Group, Kitchener ON
2016 Champion, Communitech Peer 2 Peer Group, Life and Health Sciences
2016 Member, Canadian Health Care Human Factors Consortium
- 2015 Advisory Board, CommerceLab, Stratford, ON
2015 Champion, Communitech Peer 2 Peer Group, Life and Health Sciences
2015 Member, Steering Committee, Project Alive, Centre for e-health excellence, Kitchener, ON
2015 Adjunct, The Ottawa Hospital
2015 Member, Canadian Health Care Human Factors Consortium
- 2014 CommerceLab, Advisory Board, Stratford, ON
2014 Adjunct, The Ottawa Hospital
2014 Member, Canadian Health Care Human Factors Consortium
- 2013 CommerceLab, Advisory Board, Stratford, ON
2013 Adjunct, The Ottawa Hospital
- 2012 Adjunct, The Ottawa Hospital

Editorial and Scientific Leadership Positions

- | | | |
|------|---------------------------|---|
| 2018 | Associate Editor | IIE Transactions on Occupational Ergonomics and Human Factors |
| 2018 | Associate Editor | IEEE Transactions on Human-Machine Systems |
| 2018 | Editorial Board | Journal of Cognitive Engineering and Decision Making |
| 2018 | Editorial Board | Applied Ergonomics |
| 2018 | Editorial Board | Ergonomics |
| 2018 | Scientific Advisory Board | Applied Human Factors and Ergonomics Conference |
| 2018 | General Chair | Persuasive Technology 2018 |
| 2018 | Chair-elect | Fellows Selection Committee, Human Factors and Ergonomics Society |
| 2017 | Associate Editor | IIE Transactions on Occupational Ergonomics and Human Factors |
| 2017 | Associate Editor | IEEE Transactions on Human-Machine Systems |
| 2017 | Editorial Board | Journal of Cognitive Engineering and Decision Making |

2017	Editorial Board	Applied Ergonomics
2017	Editorial Board	Ergonomics
2017	Scientific Advisory Board	Applied Human Factors and Ergonomics Conference
2017	General Chair	Persuasive Technology 2018
2017	Best Paper Award Committee	Journal of Cognitive Engineering and Decision Making
2016	Associate Editor	IIE Transactions on Occupational Ergonomics and Human Factors
2016	Associate Editor	IEEE Transactions on Human-Machine Systems
2016	Editorial Board	Journal of Cognitive Engineering and Decision Making
2016	Editorial Board	Applied Ergonomics
2016	Editorial Board	Ergonomics
2016	Scientific Advisory Board	Applied Human Factors and Ergonomics Conference
2016	Best Paper Award Committee	Journal of Cognitive Engineering and Decision Making
2015	Associate Editor	IIE Transactions on Occupational Ergonomics and Human Factors
2015	Associate Editor	IEEE Transactions on Human-Machine Systems
2015	Editorial Board	Journal of Cognitive Engineering and Decision Making
2015	Editorial Board	Applied Ergonomics
2015	Editorial Board	Ergonomics
2015	Scientific Advisory Board	Applied Human Factors and Ergonomics Conference
2015	Intl Program Committee	13 th IFAC/IFIP/IFORS/IEA Symp on Ana Des and Eval of HMS
2015	Advisory Board	IFIP TC13 WG6 Human Work Interaction Design
2014	Associate Editor	IEEE Transactions on Human-Machine Systems
2014	Editorial Board	Journal of Cognitive Engineering and Decision Making
2014	Editorial Board	Ergonomics
2014	Scientific Advisory Board	Applied Human Factors and Ergonomics Conference
2014	Advisory Board	IFIP TC13 WG6 Human Work Interaction Design
2013	Associate Editor	IEEE Transactions on Human-Machine Systems
2013	Editorial Board	Journal of Cognitive Engineering and Decision Making
2013	Editorial Board	Ergonomics
2013	Editorial Board	Journal of Cognitive Engineering and Decision Making
2013	Editorial Board	Ergonomics
2013	Editorial Board	IIE Transactions on Occupational Ergonomics and Human Factors
2012	Editorial Board	Journal of Cognitive Engineering and Decision Making
2012	Editorial Board	Ergonomics
2012	Editorial Board	IIE Transactions on Occupational Ergonomics and Human Factors
2012	Program Committee	ASME 2012 11 th Biennial conference on eng systems, des and ana
2012	Program Committee	8 th International Conference on Persuasive Technology
2011	Editorial Board	Journal of Cognitive Engineering and Decision Making
2011	Editorial Board	Ergonomics

2011	Editorial Board	IIE Transactions on Occupational Ergonomics and Human Factors
2011	Technical Committee	International Ergonomics Association, Visual Ergonomics
2010	Editorial Board	Journal of Cognitive Engineering and Decision Making
2010	Editorial Board	Ergonomics
2010	Editorial Board	IIE Transactions on Occupational Ergonomics and Human Factors
2009	Technical Group Chair	Human Factors and Ergonomics Society, CEDM Technical Group
2009	Council of Technical Groups	Human Factors and Ergonomics Society
2009	Program Chair	International Ergonomics Association, Displays and Warnings
2009	Editorial Board	Ergonomics
2008	Technical Group Chair	Human Factors and Ergonomics Society, CEDM Technical Group
2008	Council of Technical Groups	Human Factors and Ergonomics Society
2008	Program Chair	International Ergonomics Association, Displays and Warnings
2008	Editorial Board	Ergonomics
2008	Associate Editor	International Journal of Human Computer Studies
2008	Editorial Board	IEEE Transactions on Systems, Man and Cybernetics
2007	Program Chair	Human Factors and Ergonomics Society, CEDM Technical Group
2007	Program Chair	International Ergonomics Association, Displays and Warnings
2007	Editorial Board	Ergonomics
2007	Associate Editor	International Journal of Human Computer Studies
2006	Program Chair	Human Factors and Ergonomics Society, CEDM Technical Group
2006	Associate Editor	International Journal of Human Computer Studies
2006	Technical Committee	IEEE SMC Human-Machine Systems Technical Group
2005	Co-chair	Glen Helen Discussion Panel on Cog and Sys Eng co-Practice
2005	Program Chair	Human Factors and Ergonomics Society, CEDM Technical Group
2005	Associate Editor	International Journal of Human Computer Studies
2005	Program Chair Elect	Human Factors and Ergonomics Society, CEDM Technical Group
2005	Associate Editor	International Journal of Human Computer Studies
2004	Program Chair Elect	Human Factors and Ergonomics Society, CEDM Technical Group
2004	Associate Editor	International Journal of Human Computer Studies
2003	Associate Editor	International Journal of Human Computer Studies
2003	Member	IEEE Reliability Society Committee on Human Interface
2003	Member	US DOD Technical Advisory Committee on Human Factors

Positions and Service to Funding Organizations

2018 Member, NSERC Ontario Advisory Committee

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Catherine M. Burns

2018 Member, NSERC/NCDEAS Liaison Committee

2017 Chair, Ontario Research Fund Adjudication Panel, Large Infrastructure (ITC)
2017 Member, NSERC Ontario Advisory Committee
2017 Member, NSERC/NCDEAS Liaison Committee

2016 Member, NSERC Ontario Advisory Committee
2016 Member, Ontario Research Fund Adjudication Panel, Large Infrastructure (ITC)
2016 Reviewer, MITACS College of Reviewers
2016 Reviewer, South Africa's National Research Foundation
2016 Reviewer, Canada Research Chair Program

2015 Member, NSERC Ontario Advisory Committee
2015 Reviewer, MITACS College of Reviewers

2014 Member, NSERC Ontario Advisory Committee
2014 Member, Ontario Research Fund Adjudication Panel, Large Infrastructure (ITC)
2014 Reviewer, MITACS College of Reviewers
2014 Reviewer, National Science Foundation, USA

2013 Reviewer, MITACS College of Reviewers
2013 NSERC Discovery Grant Appeals Committee

2012 Member, Ontario Research Fund Adjudication Panel, Large Infrastructure (ITC)
2012 Reviewer, NSERC Steacie Award
2012 Reviewer, Region Centre Biopharmaceuticals, Government of France
2012 NSERC Discovery Grant Appeals Committee

2011 Chair, NSERC Industrial and Systems Engineering Grant Selection Committee
2011 Member, Ontario Research Fund Adjudication Panel, Large Infrastructure (ITC)
2011 Reviewer, Qatar National Research Fund
2011 Reviewer, Defence Canada Technology Investment Fund

2010 Chair, NSERC Industrial and Systems Engineering Grant Selection Committee
2010 Reviewer, Qatar National Research Fund

2009 Chair, NSERC Industrial and Systems Engineering Grant Selection Committee
2009 Reviewer, Qatar National Research Fund

2008 Member, NSERC Industrial and Systems Engineering Grant Selection Committee
2008 Reviewer, Medical Research Council, UK
2008 Reviewer, Canadian Foundation for Innovation
2008 Reviewer, DRDC Canada Internal Funding Program
2008 Reviewer, Qatar National Research Fund

2005 Member, CRESTech Human Performance in Aerospace Environments Grant Selection Committee

2004 Member, CRESTech Human Performance in Aerospace Environments Grant Selection Committee

2003 Member, CRESTech Human Performance in Aerospace Environments Grant Selection Committee

Service to the University of Waterloo

2018 Academic Freedom and Tenure Committee (1 case)

2018 Department Advisory Committee on Appointments (ECE 1)

2018 Strategic Plan Research Excellence and Crossing Borders and Interdisciplinary Issues Committee

2018 Canada Research Chair Selection Committee (Civil and Chemical Engineering, 1 chair selected)

2018 CERC Advisory Committee on Appointments

2018 Chair, Biomedical Graduate Program Planning Committee

2018 Faculty Advisor to the Human Factors Student Group

2018 Point of contact for the Human Factors program with the Human Factors and Ergonomics Society

2017 University of Waterloo Research Ethics and Integrity Advisory Committee

2017 Academic Freedom and Tenure Committee (1 case)

2017 University of Waterloo, Faculty Grievance Committee

2017 VP Academic and Provost Delegate to the Director, SPPHS appointment committee

2017 Department Advisory Committee on Appointments (SYDE 2, ECE 1)

2017 Canada Research Chair Selection Committee (Mechanical Engineering – 3 chairs selected)

2017 Chair, Biomedical Graduate Program Planning Committee

2017 Faculty Advisor to the Human Factors Student Group

2017 Point of contact for the Human Factors program with the Human Factors and Ergonomics Society

2017 Faculty Advisor, Student team, Stanford Center on Longevity Design Challenge (finalists)

2017 Class of 1992 Reunion Team Leader

2016 University of Waterloo Research Ethics and Integrity Advisory Committee

2016 Academic Freedom and Tenure Committee

2016 University of Waterloo, Faculty Grievance Committee

2016 Chronic Disease Prevention Institute Steering Committee

2016 Department Advisory Committee on Appointments

2016 Department Advisory Committee on the Schlegel Research Chair

2016 Chair, Biomedical Graduate Program Planning Committee

2016 Canada Research Chair Selection Committee for Mechatronics and Mechanical Engineering

2016 Faculty Advisor to the Human Factors Student Group, Bronze award winners*

2016 Point of contact for the Human Factors program with the Human Factors and Ergonomics Society

2015 University of Waterloo, Faculty Grievance Committee

2015 Academic Freedom and Tenure Committee

2015 Chronic Disease Prevention Institute Steering Committee

2015 University of Waterloo Research Ethics and Integrity Advisory Committee

2015 REIAC Subcommittee on Biomedical Device Safety

2015 Department Advisory Committee on Appointments

2015 Department Advisory Committee on the Schlegel Research Chair

2015 Chair, Biomedical Graduate Program Planning Committee
 2015 Engineering NSERC RTI Proposals Internal Selection Committee
 2015 Faculty Advisor to the Human Factors Student Group, Bronze award winners*
 2015 Point of contact for the Human Factors program with the Human Factors and Ergonomics Society

2015 Academic Freedom and Tenure Committee
 2015 Chronic Disease Prevention Institute Steering Committee
 2014 Department Advisory Committee on Appointments
 2014 Tenure and Promotion Committee
 2014 Engineering NSERC RTI Proposals Internal Selection Committee

2014 Faculty Advisor to the Human Factors Student Group
 2014 Point of contact for the Human Factors program with the Human Factors and Ergonomics Society
 2014 Tenure and Promotion Committee

2013 Department Advisory Committee on Appointments
 2013 Tenure and Promotion Committee
 2013 Class Professor

2011 Tenure and Promotion Committee, School of Architecture
 2011 Biomedical Program Committee
 2011 Academic Freedom and Tenure Committee

2010 Tenure and Promotion Committee, School of Architecture
 2010 Tenure and Promotion Committee, Systems Design Engineering
 2010 Undergraduate Curriculum Committee

2009 Human Research Ethics Committee
 2009 Undergraduate Curriculum Committee

2008 Human Research Ethics Committee
 2008 Faculty Association Subcommittee on Equity in Hiring
 2008 Undergraduate Curriculum Committee
 2008 Department Advisory Committee on Appointments
 2008 Mentor to 3 Disney Imagineering teams

2007 Human Research Ethics Committee
 2007 Undergraduate Curriculum Committee
 2007 Department Advisory Committee on Appointments
 2007 Faculty Advisor to WATCHI, the Waterloo Computer Human Interaction Group
 2007 Mentor to the Disney Imagineering team, Finalist

2006 Human Research Ethics Committee
 2006 Department Advisory Committee on Appointments
 2006 Faculty Advisor to WATCHI, the Waterloo Computer Human Interaction Group
 2006 Department rep to Expectations

- 2006 OCGS Consultant on the OCGS review of Software Engineering, McMaster University
- 2006 Mentor to the Disney Imagineering team, Winners

- 2005 Faculty Advisor to WATCHI, the Waterloo Computer Human Interaction Group

- 2004 Graduate Studies Committee
- 2004 Design Workshop Committee
- 2004 Department Long Range Planning Committee
- 2004 Chair Appointment Committee
- 2004 Faculty Advisor to WATCHI, the Waterloo Computer Human Interaction Group
- 2004 Engineering Alumni Achievement Medal Nominating Committee
- 2004 Associate Dean of Research Advisory Committee

- 2003 Graduate Studies Committee
- 2003 Department Advisory Committee on Appointments
- 2003 Design Workshop Committee
- 2003 Department Long Range Planning Committee
- 2003 Chair Appointment Committee
- 2003 Faculty Safety Committee

- 2002 Graduate Studies Committee
- 2002 Department Advisory Committee on Appointments
- 2002 Design Workshop Committee

- 2001 Engineering Faculty Council
- 2001 Women in Engineering Committee

- 2000 Engineering Faculty Council
- 2000 Women in Engineering Committee

Graduate Students Supervised

Post doctoral Fellows

- | | | |
|--------------|------------------|---|
| 2018-present | Yeti Li | |
| 2017-present | Reicilis Casares | |
| 2016-2017 | Jessie Chin | Assistant Professor, University of Illinois Chicago |
| 2016-2017 | Carlos Lucena | Global Operators Manager at Eagle's Flight |
| 2014-2016 | Dev Minotra | Post doctoral fellow at Georgia Institute of Technology |

PhD students

- | | | |
|--------------|-------------------|--|
| 2017-present | Murat Dikmen | |
| 2017-present | Krizia Francisco | Portfolio Manager, Digital Health and Innovation, WWLHIN |
| 2017-present | Ramtin Lotfabdi | Professor, Sheridan College |
| 2013-2017 | Yeti Li | Post doctoral fellow in my lab |
| 2012-present | Leila Rezai | User experience designer, TELUS Health |
| 2012-2017 | Justin St-Maurice | Professor, Health Informatics, Conestoga College |

2012-2016	Alessandro Jatoba	Lecturer, Federal University of Rio de Janeiro
2011-2015	Vivek Kant	Post doctoral fellow at Nanyang University, Singapore
2010-2014	Plinio Morita	Vanier Scholar, Emerging Leader Chair, University of Waterloo
2009-2013	Tom Robinson	Software Engineer at Google, California
2009-2012	Maryam Ashoori	Cool things Czar at IBM Research, NY
2005-2008	Theresa Davies	Assistant Professor, Mechanical Engineering, Queens University

Masters students

2018-present	Harjot Pumar	
2017-present	Thana Hussein	
2017-present	David Qin	
2015-2017	Anson Ho	User Experience Researcher, Microsoft
2015-2017	Damla Kerestecioglu	Senior User Researcher, Toronto Dominion
2015-2017	Murat Dikmen	PhD. student
2014-2016	Elizabeth Kittel	Human Factors Lead at Terrestrial Energy Inc.
2012-2013	Yeti Li	PhD student, University of Waterloo
2010-2012	Behzad Aghaei	Product Designer, Facebook
2009-2011	Wayne Giang	Phd Student, University of Toronto
2009-2011	Adam Euerby	Senior Product Designer FairVentures
2006-2008	Jennifer Jeon	Patient Safety Specialist, St. Michael's Hospital, Toronto
2005-2007	Huei-Yen Winnie Chen	Assistant Professor, Industrial Engineering, SUNY Buffalo
2005-2006	Yukari Enomoto	Team Lead, The Hospital for Sick Children, Toronto
2004-2006	Munira Jessa	Senior Project Manager, Alberta Health Services, Calgary.
2004-2007	Jordanna Kwok	UI/UX Engineer at Netflix, San Francisco
2002-2005	Ed Barsalou	Professor, Software Engineering Technology, Conestoga
2002-2005	Brian Mekdeci	Research Fellow, University of South Australia
2002-2004	Danny Ho	Innovation Activator at LCBO, Waterloo
2002-2004	Shelley Zhou	Systems Engineer, Queens University
2001-2004	Roshanak Namidian	Human Factors Designer at CANDU Energy, Mississauga
2000-2002	Angela Garabet	Research Associate, Liberty Mutual Research Institute
2000-2002	Oliver St-Cyr	Lecturer, University of Toronto
1999-2001	Johnson Kuo	User experience designer, Agfa Health care