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# How Do We Optimize Risk in Enterprise Architecture when Deploying Emerging Technologies?

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**Abstract.** Emerging Technologies which merge cyber-physical systems continue to transform businesses and digital agility in transformative ways. Importantly, most investigations around focus on either cyber risk or the risk around physical systems but it does not encompass both. However, the immediate challenge is new opportunities occurring with emerging technologies. Examples include automobiles, the Internet of Things (IoT), medical devices, and building controls. In this study we will focus identifying risk as an optimization not a minimization problem and how to develop a practical approach for executives and boards to use in the oversight of cyber physical systems. Based on interviews with executive leadership teams and boards of directors we explored the over-arching research question: How can we apply a risk-based approach to cyber-physical security and what questions should business leaders be asking? The research methodology used a survey instrument and multiple qualitative methods involving business leaders from 60 companies and 80 business leaders from September 2018 – September 2019. Based on this analysis, we developed an extended framework for executives, as well as questions and process for boards to consider as part of their oversight. The Extended Risk-Based Approach equips boards and executives as they begin to develop their thinking around enterprise cyber physical risk.

**Keywords:** Emerging Technologies, Cyber Security, Information Security, Cyber Physical Risk, Internet of Things (IoT)

## References

1. Shultz, R. (2019), "CIOs Most Worried About Security, Next About Moving To The Cloud," MediaPost <https://www.mediapost.com/publications/article/343626/cios-most-worried-about-security-next-about-movin.html>
2. Griffy-Brown C., Miller, H., Zhao, V., Lazarikos, D., Chun, M. (2020) Making better risk decisions in a new technology environment. *Engineering Management Review*, Vol 48, No. 1, pp. 1-10.
3. Griffy-Brown C., Lazarikos D., Chun, M.S. (2019). Emerging Technologies and Risk: How do we secure the Internet of Things (IoT) environment? *Journal of Applied Business and Economics*, 21 (2).
4. Miller, H. and Griffy-Brown, C. (2018). Developing a Methodology for Assessing Cyber Risk for Business Leaders. *Journal of Applied Business and Economics*, 20 (3), 100-114.
5. Griffy-Brown C., Lazarikos D., Chun, M. S. How Do You Secure an Environment Without a Perimeter? Using Emerging Technology Processes to Support Information Security Efforts in an Agile Data Center. *Journal of Applied Business and Economics*. 18:1. pp. 90-102, 2016.
6. Griffy-Brown C., Lazarikos D., Chun, M.S. Agile Business Growth and Cyber Risk: How do we secure the IoT Environment? IEEE Temscon Proceedings, June 28-July 1, 2018, Evanston, Illinois.
7. Honer, P. Cloud Computing Security Requirements and Solutions: A Systematic Literature Review. Thesis. University of Twente, Faculty of Engineering and Mathematics and Computer Science. Enschede, Netherlands, 2013.
8. Crawford K., Calo R. There is a Blind Spot in AI Research. *Nature*, v. 538:7625, 2016.
9. Martin C.D., Makoundou, T. Taking the High Road: Ethics by Design in AI, *Association for*

- Computing Machinery*. v 8, Issue 4, pp. 35-37, 2017.
10. Kumar P.S., Sburamanian R. Homomorphic Storage Security in Cloud Computing. *Infomraiotn Internaitonal Interdisciplinary Journal*. v.14, issue10, pp. 3465-3476, 2011.
  11. Nishikawa K., Oki K. , and Matsuo A. SaaS application framework using information gateway enabling cloud service with data confidentiality. Hong Kong, 2012.
  12. Tran D. H., Nguyen H. L., Zha W., and Ng W. K., Towards security in sharing data on cloud-based social networks. Singapore, 2011.
  13. Deshmukh A., Mihovska A., and Prasad R. A cloud computing security schemes:- TGOS and TMS. Trivandrum, 2012.
  14. Gul A., Rehman A.Ur, and M.H. Islam, Cloud computing security auditing. Gyeongju, University of Twente, Faculty of Engineering and Mathematics and Computer Science, 2013.
  15. Munoz A., J. Gonzalez and A. Mana, A Performance-Oriented Monitoring System for Security Properties in Cloud Computing Applications. *Computer Journal*, v 55, issue 4 ,pp. 979-994, August 2012.
  16. Ilanchezhian J., Varadharassu V., Ranjeeth A. and Arun K. To improve the current security model and efficiency in cloud computing using access control matrix. Tamilnadu, 2012.
  17. Zhu J., Wen Q., SaaS access control research based on UCON. Guangzhou, 2012.
  18. Colbert, E. (2017). Security of Cyber Physical Systems. *Journal of Cyber Security and Information Systems*, Volume: 5 Number: 1 ,pp 1-5.
  19. Cardenas, A. A., Amin, S., & Sastry, S. (2008, June). "Secure Control: Towards Survivable Cyber-Physical Systems," in Proceedings of the 28th International Conference on Distributed Computing Systems Workshops-Volume 00, IEEE Computer Society, pp. 495-500
  20. Colbert, E. & Hutchinson, S. (2016) "Intrusion Detection in Industrial Control Systems," in Cyber-security of SCADA and Other Industrial Control Systems (eds. E. Colbert & A. Kott) (Springer: New York).
  21. Colbert, E., Sullivan, D., Hutchinson, S., Renard, K., and Smith, S. (2016) "A Process-Oriented Intrusion Detection Method for Industrial Control Systems," in Proceedings of the 11th International Conference on Cyber Warfare and Security (ICWS2016), p. 497.
  22. Colbert, E., & Kott, A. (2016) *Cyber Security of SCADA and Other Industrial Control Systems* (Springer: New York).
  23. H. Elham, H., Lebbat, A. and HX-DoS attacks against cloud web services. Melbourne, 2012.
  24. P. Ryan and R. Watson. Research Challenges for the Internet of Things: What Role Can OR Play? *Systems*. v 5, issue 24, pp. 2-32, 2017.
  25. Forrester J. W. System Dynamics – a personal view of the first fifty years. *System Dynamics Review*, v 23, pp. 345-358, 2007.
  26. Yin, R. Case Study Research: Design and Methods. Sage Publications. Thousand Oaks, CA. 1994.
  27. Strauss and Corbin. Basics of Qualitative Research: Grounded Theory Procedures and Techniques, 2<sup>nd</sup> Edition. Sage Publications. Thousand Oaks, CA, 2015.

# Video Advertising: Connection and differences between consumers?

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**Abstract.** The internet search trend has caused that online user are looking for more and more enriched information. The evolution of social media has been huge and users relate to social networks differently than they did before. Currently, there are more than 4 billion active users on social networks and brands are looking to showcase their products and services. Our research found the following factors that influence social media engagement: informativeness, self-connection and advertising stimulation. Through literature review, we propose a conceptual model that has been tested in the PLS-SEM. Data were collected from 237 consumers and our survey found that engagement in social media is explained by the variables identified by our model. Important contributions to brand theory and management will be found in this investigation.

**Keywords:** Social Media Engagement, Video Advertising, Self Brand Connection.

## References

1. Escalas, J. E.: Self-referencing and persuasion: Narrative transportation versus analytical elaboration. *Journal of Consumer Research*, 33, 421-429 (2007).
2. van Laer, T., de Ruyter, K., Visconti, L. M., & Wetzels, M.: The extended transportation-imagery model: A meta-analysis of the antecedents and consequences of consumers' narrative transportation. *Journal of Consumer Research*, 40(5), 797-817 (2014).
3. Brechman, J. M. & Purvis, S. C.: Narrative, transportation and advertising. *International Journal of Advertising*, 34(2), 366-381 (2015).
4. Chang, C.: Being Hooked by editorial content: The implications for processing narrative advertising. *Journal of Advertising*, 38(1), 21-34 (2009).
5. Kleine, S. S. & Baker, S.M.: An Integrative Review of Material Possession Attachment. *Academy of Marketing Science Review* 1(1), 124-124 (2004).
6. Ge, J. & Gretzel, U: Emoji rhetoric: a social media influencer perspective. *Journal of Marketing Management*, 34 (15-16), 1272-1295 (2018).
7. Sobhanifard, Y. & Sadatfarizani, S.: Triplex modeling of the political messages consumer behavior in social networks. *Journal of Consumer Behaviour*, 17(3), 187-196 (2018).
8. Ferreira, B., Marques, H., Caetano, J., Rasquilha, L., & Rodrigues, M.: *Fundamentos de Marketing*. Lisboa, Portugal: Edições Sílabo (2012).
9. Kotler, P., & Keller, K. L.: *Marketing Management*. Boston, U.S.A: Prentice Hall (2012).
10. Lee, J., Hong, I.B.: Predicting positive user responses to social media advertising: The roles of emotional appeal, informativeness, and creativity. *International Journal of Information Management* 36, 360-373 (2016).
11. Arora, T. & Agarwal, B.: Empirical Study on Perceived Value and Attitude of Millennials Towards Social Media Advertising: A Structural Equation Modelling Approach. *Vision: The Journal of Business Perspective*, 23(1), 56-69 (2019).
12. Hilde, A. M. V.; van Noort, G.; Muntinga D. G. & Bronner, F.: Engagement with Social Media and Social Media Advertising: The Differentiating Role of Platform Type. *Journal of Advertising*, 47(1), 38-54 (2018).
13. Mittal, B.: I, Me and Mine: How Products Become Consumers' Extended Selves. *Journal of Consumer Behavior*, 5 (6), 550-62 (2006).

14. Park, C. W., MacInnis, D. J., Priester, J., Eisingerich, A. B., & Iacobucci, D.: Brand attachment and brand attitude strength: Conceptual and empirical differentiation of two critical brand equity drivers. *Journal of Marketing*, 74, 1–17 (2010).
15. Kleine, S.S., Baker, S.M., Schultz, S.E., & Baker, M.: An Integrative Review of Material Possession Attachment. *Academy of Marketing Science Review*, 1(1), (2004)
16. Escalas, J.E & Bettman, R. J.: You Are What They Eat: The Influence of Reference Groups on Consumers' Connections to Brands. *Journal of Consumer Psychology* 13(3), 339-348 (2003).
17. Swaminathan, V., Page, K. L., & Gürhan-Canli, Z.: My' brand or 'our' brand: The effects of brand relationship dimensions and self-construal on brand evaluations. *Journal of Consumer Research*, 34(2), 248–259 (2007).
18. Sirgy, J. M.: Self-concept in consumer behaviour: A critical review. *Journal of Consumer Research*, 9, 287–300 (1982).
19. Baumeister, R. F., & Vohs, K. D.: Self-regulation and the executive function of the self. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (2012).
20. Hogg, M.A.: Subjective Uncertainty Reduction through Self-categorization: A Motivational Theory of Social Identity Processes. *European Review of Social Psychology*, 11(1), 223-255 (2000).
21. Thomson, M., MacInnis, D. J., & Park, C. W.: The ties that bind: Measuring the strength of consumers' emotional attachments to brands. *Journal of Consumer Psychology*, 15, 77–91 (2005).
22. Schmalz, S., & Orth, U. R.: Brand attachment and consumer emotional response to unethical firm behavior. *Psychology & Marketing*, 29, 869–884 (2012).
23. Thomson, M.: Human brands: Investigating antecedents to consumers' strong attachments to celebrities. *Journal of Marketing*, 70, 104–111(2006).
24. Park, C. W., MacInnis, D. J., & Priester, J.: Beyond attitudes: Attachment and consumer behavior. *Seoul Journal of Business*, 12, 3–35 (2006).
25. Kabadayi, S., & Price, K.: Consumer – Brand engagement on Facebook: Liking and commenting behaviors. *Journal of Research in Interactive Marketing*, 8, 203–223 (2014).
26. Calder, B.J; Malthouse, E.C; & Schaedel, U.: An Experimental Study of the Relationship between Online Engagement and Advertising Effectiveness. *Journal of Interactive Marketing*, 23(4), 321-331(2009).
27. Hollebeek, L.D., Glynn, M.S., Brodie, R.J.: Consumer brand engagement in social media: conceptualization, scale development and validation. *Journal of Interactive Marketing* 28 (2), 149–165 (2014).
28. Schivinski, B., & Dabrowski, D.: The impact of brand communication on brand equity through Facebook. *Journal of Research in Interactive Marketing*, 9(1), 31–53 (2015).
29. Leckie, C.; Nyadzayo, M.W & Johnson, L.W.: Antecedents of consumer brand engagement and brand loyalty. *Journal of Marketing Management*, 32 (5-6), 558-578 (2016).
30. Algharabat, R.S.: Linking social media marketing activities with brand love: The mediating role of self-expressive brands. *Kybernetes*, 46 (10), 1801-1819 (2017).
31. Schau, J.; Gilly, M.: We Are What We Post? Self-Presentation in Personal Web Space. *Journal of Consumer Research*, 30(3), 385-404 (2003).
32. Ling, K., Beenen, G., Ludford, P., Wang, X., Chang, K., Cosley, D., Frankowski, D., Terveen, L., Rashid, A. M., Resnick, P. and Kraut, R.: Using social psychology to motivate contributions to online communi-ties. *Journal of Computer-Mediated Communication*, 10 (4), (2005).
33. Wang, J.-L., Wang, H.-Z., Gaskin, J., Hawk, S.: The mediating roles of upward social comparison and self-esteem and the moderating role of social comparison orientation in the association between social networking site usage and subjective well-being. *Frontiers in Psychology*, 8, Article 771. (2017).
34. Kim, D.H., Seely, N., & Jung, J.: Do you prefer, Pinterest or Instagram? The role of image-sharing SNSs and self-monitoring in enhancing ad effectiveness. *Comput. Hum. Behav.*, 70, 535-543. (2017).
35. Muntinga, D.G., Moorman, M.; & Smit, E.G.: Introducing COBRAS: exploring motivations for brand-related social media use. *Interactive Journal of Advertising*, 30 (1), 13–46 (2011).
36. Demmers, J., Weltevreden, J.W.J; & van Dolen, W.M.: Consumer Engagement with Brand Posts on Social Media in Consecutive Stages of the Customer Journey. *International Journal of Electronic Commerce*, 24 (1), 53-77 (2020).
37. Zhang, Z., & Gupta, B.: Social media security and trustworthiness: Overview and new direction. *Future Gener. Comput. Syst.*, 86, 914-925 (2018).
38. Schivinski, B., & Dabrowski, D.: The impact of brand communication on brand equity through Facebook. *Journal of Research in Interactive Marketing*, 9(1), 31–53 (2015).

39. Leckie, C.; Nyadzayo, M.W & Johnson, L.W.: Antecedents of consumer brand engagement and brand loyalty. *Journal of Marketing Management*, 32 (5-6), 558-578 (2016).
40. Kim, J., Park, J., & Glovinsky, L.: Customer involvement, fashion consciousness, and loyalty for fast-fashion retailers. *Journal of Fashion Marketing and Management*, 22(3), 301-316 (2018).
41. Hutter, K., Hautz, J., Dennhardt, S. & Füller, J.: The impact of user interactions in social media on brand awareness and purchase intention: the case of mini on Facebook. *Journal of Product & Brand Management*, 22 (5), 342-351 (2013).
42. Lujja, A. & Özata, F. Z.: The Consequences of Consumer Engagement in Social Networking Sites. *Business and Economics Research Journal*, Uludag University, Faculty of Economics and Administrative Sciences, 8(2), 275-291 (2018).
43. Dessart, L.: Social media engagement: a model of antecedents and relational outcomes. *Journal of Marketing Management*, 33(5-6), 375-399 (2017).
44. Pentina, I., Guilloux, V., & Micu, A.: Exploring social media engagement behaviors in the context of luxury brands. *Journal of Advertising*, 47(1), 55-69 (2018).
45. Guercini, S.; Mir, P.; Prentice, C.: New marketing in fashion e-commerce. *Journal of Global Fashion Marketing*, 9(1), 1-8 (2018).
46. Wang, A.: Advertising engagement: A driver of message involvement on message effects. *Journal of Advertising Research*, 46(4), 355-368 (2006).
47. Jeon, M.M., Lee, S., Jeong, M.: Perceived corporate social responsibility and customers' behaviors in the ridesharing service industry. *International Journal of Hospitality Management* 84, 102341 (2020).
48. Voorveld, H.A.M., van Noort, G., Muntinga, D.G., Bronner, F.: Engagement with Social Media and Social Media Advertising: The Differentiating Role of Platform Type. *Journal of Advertising* 47, 38-54 (2018).
49. Hair, J.F., Hult, G.T.M., Ringle, C., Sarstedt, M.: A primer on partial least squares structural equation modeling (PLS-SEM). Sage publications (2016).
50. Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., Podsakoff, N.P.: Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology* 88, 879-903 (2003).
51. Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E.: *Multivariate Data Analysis*. Pearson Education Limited (2013).
52. Chin, W.W.: The partial least squares approach for structural equation modeling. *Modern methods for business research.*, pp. 295-336. Lawrence Erlbaum Associates Publishers, Mahwah, NJ, US (1998).
53. Bagozzi, R.P., Yi, Y., Phillips, L.W.: Assessing Construct Validity in Organizational Research. *Administrative Science Quarterly* 36, 421-458 (1991).
54. Fornell, C., Larcker, D.F.: Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research* 18, 39-50 (1981).
55. Henseler, J., Ringle, C.M., Sarstedt, M.: A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science* 43, 115-135 (2015).
56. Hu, L.-t., Bentler, P.M.: Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods* 3, 424-453 (1998).
57. Cohen, J.: *Statistical Power Analysis for the Behavioral Sciences*. Taylor & Francis (2013).
58. Ferreira, Sónia; Santo, Pedro; Santos, Sara (2020). Creative Video Ads In Covid Era: A Path To Social Media Engagement. *International E-Journal of Advances in Education*, 341-348. ISSN:2411-1822.
59. Ferreira S., Santos S., Santo P.E. (2021) Social Media Engagement Through Video Advertising: Informativeness and Self Brand Connection as Predictors. In: *ICADS 2021. Advances in Intelligent Systems and Computing*, vol 1352, 249-260. 2021. Springer, Cham. [https://doi.org/10.1007/978-3-030-71782-7\\_23](https://doi.org/10.1007/978-3-030-71782-7_23).
60. Santos, S.; Santo, P. E.; Ferreira, S. (2021) Storytelling in Advertising: From Narrative to Brand Distinctiveness. In *Advances in Design and Digital Communication Springer Series in Design and Innovation*, vol 12. Pp 516-527 Springer, Cham. ISBN13: 978-3-030-61670-0 [https://doi.org/10.1007/978-3-030-61671-7\\_48](https://doi.org/10.1007/978-3-030-61671-7_48)

# Mobility Assistants to Support Multi-Modal Routes in Smart Cities: A Scoping Review

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**Abstract.** Objectives - This study aimed to identify: (i) the current research trends related to mobility assistants to support multi-modal routes in smart cities; (ii) the types of smart cities' data being used; (iii) the methods applied to assess the proposed solutions; and iv) the major barriers for their dissemination. Methods - An electronic search was conducted in several databases, combining relevant keywords. Then titles and abstracts were screened against inclusion and exclusion criteria. Finally, the full texts of the eligible articles were retrieved and screened for inclusion. Results - A total of 19 articles were included. These articles either propose algorithms to optimize routes planning or presenting specific applications that make use of a broad range of smart cities' data. Conclusion - The number of included articles is very reduced when compared with the total number of articles related to smart cities, which means that the mobility assistants to support multi-modal routes are still not significant within the smart cities' research. Moreover, most of the included articles report applications in an early stage of development, which is a major barrier for the respective dissemination.

**Keywords:** Smart cities, Smart mobility, Mobility assistants, Scoping review.

## References

1. Urban Europe Statistics on cities, towns and suburbs 2016 edition. Eurostat, Brussels (2016).
2. Santinha, G., Castro, E. A.: Creating more intelligent cities: The role of ICT in promoting territorial governance. *Journal of Urban Technology*, 17(2), 77-98 (2010).
3. Santinha, G., Dias, A., Rodrigues, M., Queirós, A., Rodrigues, C., Rocha, N.P.: How Do Smart Cities Impact on Sustainable Urban Growth and on Opportunities for Entrepreneurship? Evidence from Portugal: The Case of Águeda. In: *Studies on Entrepreneurship, Structural Change and Industrial Dynamics*, pp. 31-53. Springer International Publishing (2018).
4. Winters, J. V.: Why are smart cities growing? Who moves and who stays? *Journal of regional science*, 51(2), 253-270 (2011).
5. Giffinger, R., Gudrun, H.: Smart cities ranking: an effective instrument for the positioning of the cities? *ACE: Architecture, City and Environment*, 4(12), 7-26 (2010).
6. Lazaroïu, G. C., Roscia, M.: Definition methodology for the smart cities model. *Energy*, 47(1), 326-332 (2012).
7. Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J. K., Kåre Thaarup, R., ... Kotterink, B.: *Mapping Smart Cities in the EU*. Directorate General for Internal Policies, Policy Department (2014).



8. Allwinkle, S., Cruickshank, P.: Creating Smarter Cities: An Overview. *Journal of Urban Technology*, 18(2), 1-16 (2011).
9. Meijer, A., Bolívar, M. P.: Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*, 82(2), 392-408 (2016).
10. Díaz-Díaz, R., Muñoz, L., Pérez-González, D.: Business model analysis of public services operating in the smart city ecosystem: The case of Smart Santander. *Future Generation Computer Systems*, 76, 198-214 (2017).
11. Chauhan, S., Agarwal, N., Kar, A. K.: Addressing big data challenges in smart cities: a systematic literature review. *Info*, 18(4), 73-90 (2016).
12. Vanolo, A.: Smartmentality: The smart city as disciplinary strategy. *Urban studies*, 51(5), 883-898 (2014).
13. Marcos-Pablos, S.; García-Peñalvo, F. J.: Technological ecosystems in care and assistance: a systematic literature review. *Sensors*, 19(3), 708 (2019).
14. Vidović, K., Šoštarić, M., Budimir, D.: An Overview of Indicators and Indices Used for Urban Mobility Assessment. *Promet-Traffic & Transportation*, 31(6), 703-714 (2019).
15. Benevolo, C., Dameri, R. P., D'Auria, B.: Smart mobility in smart city. In: *Empowering Organizations*, pp. 13-28. Springer, Cham (2016).
16. All, S. P., Klug, K.: Key to Innovation Integrated Solution Multimodal personal mobility. European Commission, Brussels (2013).
17. Papa, E., Lauwers, D.: Smart mobility: opportunity or threat to innovate places and cities. In: 20th international conference on urban planning and regional development in the information society (REAL CORP 2015), pp. 543-550. Real Corp (2015).
18. United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development*. 2020. Available online: <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication> (accessed on 4 May 2021).
19. Mangiaracina, R., Perego, A., Salvadori, G., Tumino, A.: A comprehensive view of intelligent transport systems for urban smart mobility. *International Journal of Logistics Research and Applications*, 20(1), 39-52 (2017).
20. Sumalee, A., Ho, H. W.: Smarter and more connected: Future intelligent transportation system. *IATSS Research*, 42(2), 67-71 (2018).
21. Pauer, G.: Development potentials and strategic objectives of intelligent transport systems improving road safety. *Transport and Telecommunication Journal*, 18(1), 15-24 (2017).
22. Reagan, I. J., Cicchino, J. B., Kerfoot, L. B., Weast, R. A.: Crash avoidance and driver assistance technologies - Are they used? *Transportation research part F: traffic psychology and behaviour*, 52, 176-190 (2018).
23. Paiva, S., Ahad, M. A., Tripathi, G., Feroz, N., Casalino, G.: Enabling Technologies for Urban Smart Mobility: Recent Trends, Opportunities and Challenges. *Sensors*, 21(6), 2143 (2021).
24. Tosi, D., Marzorati, S.: Big data from cellular networks: real mobility scenarios for future smart cities. In: 2nd international conference on big data computing service and applications (BigDataService), pp. 131-141. IEEE (2016).
25. Calabrese, F., Colonna, M., Lovisolo, P., Parata, D., Ratti, C.: Real-time urban monitoring using cell phones: A case study in Rome. *IEEE Transactions on Intelligent Transportation Systems* 12(1), 141-151 (2010).
26. Lawrence, F., Kavage, S., Litman, T.: Promoting public health through smart growth: building healthier communities through transportation and land use policies and practices. APA (2006).
27. Bencardino, M., Greco, I.: Smart communities. *Social innovation at the service of the smart cities*. TeMA. J. Land Use Mob. Environ, Special Issue, 39-51 (2014).
28. Irshad, M.: A systematic review of information security frameworks in the internet of things (iot). In: 2016 IEEE 18th International Conference on High Performance Computing and Communications; IEEE 14th International Conference on Smart City; IEEE 2nd International Conference on Data Science and Systems (HPCC/SmartCity/DSS). IEEE (2016).
29. Purnomo, F., Prabowo, H.: Smart city indicators: A systematic literature review. *Journal of Telecommunication, Electronic and Computer Engineering (JTEC)*, 8(3), 161-164 (2016).
30. Rocha, N. P., Dias, A., Santinha, G., Rodrigues, M., Queirós, A., Rodrigues, C.: Smart mobility: a systematic literature review of mobility assistants to support multi-modal transportation situations in smart cities. In: *International Conference on Integrated Science, LNNS*, 136, pp. 303-312. Springer, Cham (2021). [https://doi.org/10.1007/978-3-030-49264-9\\_27](https://doi.org/10.1007/978-3-030-49264-9_27).
31. Prandi, C., Mirri, S., Ferretti, S., Salomoni, P.: On the need of trustworthy sensing and crowdsourcing for urban accessibility in smart city. *ACM Transactions on Internet Technology (TOIT)*, 18 (1), 1-21 (2017).

32. Ramirez, A. R. G., González-Carrasco, I., Jasper, G. H., Lopez, A. L., Lopez-Cuadrado, J. L., García-Crespo, A.: Towards human smart cities: internet of things for sensory impaired individuals. *Computing*, 99 (1): 107-126 (2017).
33. Zhou, J., Corcoran, J., Borsellino, R.: Mapping cities by transit riders' trajectories: The case of Brisbane, Australia. *Environment and Planning A* 49(8), 1707-1709 (2017).
34. Jung, J. Y., Heo, G., Oh, K.: Urban Zone Discovery from Smart Card-Based Transit Logs. *IEICE Transactions on Information and Systems*, 100(10), 2465-2469 (2017).
35. Lee, J., Gutesa, S.: Human factor evaluation of invehicle signal assistance system. In: *SmartWorld, Ubiquitous Intelligence & Computing, Advanced & Trusted Computed, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovation (SmartWorld/SCALCOM/UIC/ATC/ CBD-Com/IOP/SCI)*, pp. 1-6. IEEE (2017).
36. Betancur, M. J., Restrepo, V., Pérez, J. J., Restrepo, J. A., Agudelo, A., Cuartas-Ramírez, D.: An Approximation to the Construction of Pedestrian Smart Cities. In: *4th Colombian Conference on Automatic Control (CCAC)*, pp. 1-6. IEEE (2019).
37. Nasibov, E., Berberler, M. E., Diker, A. C., Atilgan, C.: Optimal journey planning depending on distance and passenger density parameters. In: *7th International Conference on Application of Information and Communication Technologies*, pp. 1-4. IEEE (2013).
38. Mrzovic, P., Larriba-Pey, J. L., Matskin, M.: Improving mobility in smart cities with intelligent tourist trip planning. In: *41st Annual Computer Software and Applications Conference (COMPSAC)*, Vol. 1, pp. 897-907. IEEE (2017).
39. Tomaras, D., Kalogeraki, V., Liebig, T., Gunopulos, D.: Crowd-based ecofriendly trip planning. In: *19th IEEE International Conference on Mobile Data Management (MDM)*, pp. 24-33. IEEE (2018).
40. El Moufid, M., Nadir, Y., Boukhdar, K., Benhadou, S., Medromi, H.: A Distributed Approach based on Transition Graph for Resolving Multimodal Urban Transportation Problem. *International Journal of Advanced Computer Science and Applications*, 10(9), 449-454 (2019).
41. Hariz, M. B., Said, D., & Mouftah, H. T. Game Theoretic Approach for Public Multi-Mode Transportation in Smart Cities. *IET Research Journals* (2020).
42. Motta, G., Sacco, D., Belloni, A., You, L.: A system for green personal integrated mobility: A research in progress. In: *Proceedings of 2013 IEEE International Conference on Service Operations and Logistics, and Informatics*, pp. 1-6. IEEE. (2013).
43. Ni, P., Vo, H. T., Dahlmeier, D., Cai, W., Ivanchev, J., Aydt, H.: Depart: Dynamic route planning in stochastic time-dependent public transit networks. In: *18th International Conference on Intelligent Transportation Systems*, pp. 1672-1677. IEEE (2015).
44. Berlingerio, M., Bicer, V., Botea, A., Braghin, S., Lopes, N., Guidotti, R., Pratesi, F.: Mobility mining for journey planning in Rome. In: *Joint European Conference on Machine Learning and Knowledge Discovery in Databases*, pp. 222-226. Springer, Cham (2015).
45. Yu, L., Shao, D., Wu, H.: Next generation of journey planner in a smart city. In: *International Conference on Data Mining Workshop (ICDMW)*, pp. 422-429. IEEE (2015).
46. Farkas, K., Fehér, G., Benczúr, A., Sidló, C. I.: Crowdsensing Based Public Transport Information Service in Smart Cities. *Infocommunications Journal* 6(4), 13-20 (2014).
47. Di Martino, S., Rossi, S.: An architecture for a mobility recommender system in smart cities. *Procedia Computer Science*, 98, 425-430 (2016).
48. Handte, M., Foell, S., Wagner, S., Kortuem, G., Marrón, P. J.: An internet-of-things enabled connected navigation system for urban bus riders. *IEEE internet of things journal* 3(5), 735-744 (2016).
49. Botea, A., Berlingerio, M., Braghin, S., Bouillet, E., Calabrese, F., Chen, B., ..., Laumanns, M.: Docit: An integrated system for risk-averse multimodal journey advising. In: *Smart Cities and Homes*, pp. 345-359. Morgan Kaufmann (2016).
50. Retscher, G., & Obex, F.: A Cooperative Positioning Service for Multi-Modal Public Transit Situations. *The Journal of Navigation*, 71(2), 371-388 (2018).
51. Dimokas, N., Kalogirou, K., Spanidis, P., & Kehagias, D.: A Mobile Application for Multimodal Trip Planning. In: *9th International Conference on Information, Intelligence, Systems and Applications (IISA)*, pp. 1-8. IEEE (2018).
52. Kuster, C., Masuch, N., & Sivrikaya, F.: Toward an interactive mobility assistant for multi-modal transport in smart cities. In: *International Conference on Service-Oriented Computing*, pp. 321-327. Springer, Cham (2017).
53. Lai, C., Boi, F., Buschetti, A., Caboni, R.: SmartMobility, an Application for Multiple Integrated Transportation Services in a Smart City. In: *Proceedings of the 15th International Conference on Web Information Systems and Technologies (WEBIST 2019)*, pp. 58-66. INSTICC (2019).

54. Bondoc, E. R. P., Caparas, F. P. M., Macias, J. E. D., Naculangga, V. T., Estrada, J. E. MMARRS: An Intelligent Route Recommendation and Road Traffic Information System for Multimodal and Unimodal Public Transportation using Text Analysis. In: 2018 IEEE 10th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment and Management (HNICEM), pp. 1-6. IEEE (2018).
55. Al-Rahamneh, A., Astrain, J. J., Villadangos, J., Klaina, H., Guembe, I. P., Lopez-Iturri, P., Falcone, F. Enabling Customizable Services for Multimodal Smart Mobility with City-Platforms. IEEE Access, 9, 41628-41646 (2021).
56. Georgeff, M., Pell, B., Pollack, M., Tambe, M., Wooldridge, M.: The belief-desire-intention model of agency. In: International workshop on agent theories, architectures, and languages, pp. 1-10. Springer, Berlin, Heidelberg (1998).
57. Gulliksen, J., Göransson, B., Boivie, I., Blomkvist, S., Persson, J., Cajander, Å.: Key principles for user-centred systems design. Behaviour and Information Technology, 22(6), 397-409 (2003).

# Risk management in the healthcare safety management system

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**Abstract.** The paper discusses the main components of the modern system of risk management in medicine. Using the ISO 31000 standard of risk management and the ARIS integrated modeling environment, the authors have built a model of the risk management process in a medical organization, including the accounting subsystem, the risk analysis subsystem, and the risk processing subsystem. The concept of risk management proposed in the article is formulated on the basis of a system safety model, which assumes that adverse events related to the provision of medical care are based on systemic causes that under certain conditions turn into a hazard, and the latter is used to receive active threats and incidents. The risk management system is an executive block of the safety management system in a medical organization, which includes (in addition to risk management) an ideological block (a new safety culture) and an educational block (an organizational learning subsystem).

**Keywords:** health care security, risk management, latent threats, hazards, active threats, incidents.

## References

1. Voskanyan Y., Shikina I., Kidalov F., Davidov D. Medical care safety - problems and perspectives. In: Antipova T. (eds) *Integrated Science in Digital Age. ICIS 2019. Lecture Notes in Networks and Systems*, vol 78. Springer, Cham. DOI: 10.1007/978-3-030-22493-6\_26
2. Voskanjan Y., Shikina I.B. Health care safety management in modern healthcare. *Medical technology. Rating and selection*. 2019;35 (1): 18-31. (In Russ.)
3. Menshikova L.I., Ignatova O.A., Dyachkova M.G., Mordovsky E.A., Yasko N.N. Improving rating assessment as a tool for managing the quality of medical care. Arkhangelsk, publishing house NSMU. 2016. 227 p. (In Russ.)
4. Zadvornaya O.L., Voskanyan Y.E., Shikina I.B., Borisov K.N. Socio-economic aspects of medical errors and their consequences in medical organizations. *MIR (Modernization. Innovation. Research)*. 2019;10(1):99-113. (In Russ.) <https://doi.org/10.18184/2079-4665.2019.10.1.99-113>.
5. World Alliance for Patient Safety. *Forward Programme 2008—2009*. URL:[https://www.who.int/patientsafety/information\\_centre/reports/Alliance\\_Forward\\_Programme\\_2008.pdf](https://www.who.int/patientsafety/information_centre/reports/Alliance_Forward_Programme_2008.pdf)
6. WHO patient safety curriculum guide: multi-professional edition. World Health Organization 2011.
7. Roitberg G.E., Kondratova N.V. Medical organization according to the international quality standards: a practical guide to implementation. Moscow (2018); 152 p. [In Russ.].

8. World Health Organization. World health statistics: monitoring health for the SDGs, Sustainable Development Goals. Geneva, 2018. [http://www.who.int/gho/publications/world\\_health\\_statistics/2018/en/](http://www.who.int/gho/publications/world_health_statistics/2018/en/)
9. ISO Guide 73:2009 Risk management — Vocabulary — Guidelines for use in standards (IDT).
10. ISO 31000:2018, Risk management— Guidelines, IDT.
11. ISO/IEC 31010:2009 Risk management – Risk assessment techniques (IDT).
12. Starodubov V.I., Kalininskaya A.A., Zlobin A.N., Shlyafar S.I., Dementyev A.I. Evaluation of the efficiency of using the bed capacity of the central district hospital. The problems and perspectives of development of rural health care. 2002; 5: 34-36. (In Russ.)
13. Lyutsko V.V., Stepanyan A.Zh., Karimova D.Yu. Optimization of quality management of medical care in the context of reform. Basic research. 2013; 12 (2): 257-259. (in Russ.).
14. Rob Davis, Eric Brabaender: ARIS Design Platform: Getting Started with BPM. Springer, London 2007, ISBN 1-84628-612-3.
15. Voskanyan Y., Shikina I., Kidalov F., Andreeva O. Medical safety management system from the perspective of a multifactorial model of adverse events in medicine. American Journal of Emergency & Critical Care Medicine. 2020;3 (1):1-14.
16. Voskanyan Y., Kidalov F., Shikina I., Kurdyukov S., Andreeva O. Model of Individual Human Behavior in Health Care Safety Management System. (2021) In: Antipova T. (eds) Comprehensible Science. ICCS 2020. Lecture Notes in Networks and Systems, vol 186. Springer, Cham. [https://doi.org/10.1007/978-3-030-66093-2\\_40](https://doi.org/10.1007/978-3-030-66093-2_40)
17. Voskanyan Y., Shikina I., Andreeva O., Kidalov F., Davidov D. Multifactorial model of adverse events and medical safety management system. Journal of Digital Science 2020, V.2(1):29-39 DOI:10.33847/2686-8296.2.1\_3
18. Pronovost P., Weast B., Holzmüller C. et al. Evaluation of the culture of safety: a survey of clinicians and managers in an academic medical center. Qual. Saf. Health Care. 2003; 12: 405–410.
19. Lilford R., Mohammed M., Braunholtz D., Hofer T. The measurement of active errors: methodological issues. Qual. Saf. Health Care. 2003; 12 (Suppl II):118–1112.
20. Lawton R., Carruthers S., Gardner P. et al. Identifying the latent failures underpinning medication administration errors: an exploratory study. Health Services Research. 2012 August; 47 (4): 1437-1459.
21. Hoffmann B., Rohe J. Patient safety and error management. Dtsch. Arztebl. Int. 2010; 107(6): 92–99.
22. Carayon P., Schoofs Hundt A., Karsh B. et al. Work system design for patient safety: the SEIPS model. Qual. Saf. Health Care. 2006; 15(Suppl I):150–158.
23. Lyons M. Should patients have a role in patient safety? A safety engineering view. Qual. Saf. Health Care. 2007 April; 16 (2): 140-142.
24. Hibbert P., Williams H. The use of a global trigger tool to inform quality and safety in Australian general practice: a pilot study. Aust. Fam. Physician. 2014 October; 43(10):723-726.
25. Michel Ph., Quenon J., de Sarasqueta A., Scemama O. Comparison of three methods for estimating rates of adverse events and rates of preventable adverse events in acute care hospitals. BMJ. 2004 January; 328 (24): 199-202.
26. Griffin F.A., Resar R.K. IHI Global Trigger Tool for Measuring Adverse Events (Second Edition). Institute for Healthcare Improvement. Cambridge, 2009.
27. SH NCP 25 Risk Management Strategy and Policy (Version: 6). December 2018.
28. Pietra L., Calligaris L., Molendini L. et al. Medical errors and clinical risk management: state of the art. Act. Otorhinolaryng. Ital. 2005; 25: 339-346.
29. Shaw R., Drever F., Hughes H. et al. Adverse events and near-miss reporting in the NHS. Qual. Saf. Health Care. 2005; 14: 279-283.
30. Buzin V.N., Mikhaylova Yu.V., Buzina T.S., Chuhrienko I.Yu., Shikina I.B., Mikhaylov A.Yu. Russian healthcare through the eyes of the population: dynamics of satisfaction over the past 14 years (2006–2019): review of sociological studies. The Russian Journal of Preventive Medicine. 2020;23(3):42–47. (In Russ.). <https://doi.org/10.17116/profmed20202303142>
31. Voskanyan Y., Shikina I., Kidalov F., Davidov D. Assessment of Modern Health Care Opportunities in Management of Medical Care Safety. Acta Scientific Medical Sciences 3.11 (2019): 38-46. DOI:10.31080/ASMS.2019.03.0438
32. Vankov D.V., Dyakov S.V., Ivanova M.A. Telemedical technologies at the present stage of health development. Current Health Issues and Health Statistics. 2020. № 3. C. 223-235. (In Russ.)

33. Gorbatova L.N., Menshikova L.I., Tsyganova O.A. Improvement of legal risk management of a medical organization in the arctic zone (on the example of Arkhangelsk region). State audit. Right. Economy. 2017. № 1. P. 53-57. (In Russ.)

# Integrating a New Generation of Interoperability Agents into the AIDA Platform

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**Abstract.** Health is an information rich and complex environment, which makes it essential to implement interoperability in different health organizations and the consequent homogeneity among Health Information Systems (HIS). The Agency for the Integration, Dissemination and Archiving of Medical and Clinical Information (AIDA) is a consistent agent monitoring platform capable of guaranteeing the automation of information as well as the interoperability and integration of HIS. This platform was designed as a solution to the information islands that are commonly found in hospital systems, and it is currently being used in several hospitals throughout Portugal. However, like any technological innovation, the solution requires a constant health technology assessment (HTA) to ensure the absence of obsolescence and a continued efficiency and security of the platform. Hence, this article focuses on the relevance and the need for vigilance, culminating in the restructuring of certain intelligent agents that make up the AIDA platform.

**Keywords:** Health Information Systems, Interoperability, Obsolescence, Health Technology Assessment.

## References

1. Harold A Linstone. Three eras of technology foresight. *Technovation*, 31(2-3):69-76, 2011.
2. Valéria Garcia. *A Gestão e o Sucesso dos Sistemas de Informação em Saúde*. PhD thesis, 01 2016.
3. Ralph Stair and George Reynolds. *Principles of information systems*. Cengage Learning, 2020.
4. Kenneth C Laudon et al. *Management information systems: Managing the digital firm*. Pearson Education India, 2007.
5. Regina Sousa, Diana Ferreira, António Abelha, and José Machado. Step towards monitoring intelligent agents in healthcare information systems. In *World Conference on Information Systems and Technologies*, pages 510-519. Springer, 2020.
6. Mark Ciampa and Mark Revels. *Introduction to healthcare information technology*. Cengage Learning, 2012.
7. Gavan Lintern and Al Motavalli. Healthcare information systems: the cognitive challenge. *BMC medical informatics and decision making*, 18(1):1-10, 2018.
8. Reinhold Haux. Health information systems - past, present, future. *International journal of medical informatics*, 75(3-4):268-281, 2006.
9. Yousef Mehdipour and Hamideh Zerehk. Hospital information system (his): At a glance. *Asian Journal of Computer and Information Systems*, 1(2), 2013.
10. Catarina Fernandes, Filipe Portela, Manuel Filipe Santos, José Machado, and António Abelha. How to assess the acceptance of an electronic health record system? In *World Conference on Information Systems and Technologies*, pages 466-475. Springer, 2020.
11. Cristiana Neto, Diana Ferreira, António Abelha, and José Machado. Improving healthcare delivery with new interactive visualization methods. In *World Conference on Information Systems and Technologies*, pages 537-546. Springer, 2019.
12. Luciana Cardoso, Fernando Marins, Filipe Portela, Manuel Santos, António Abelha, and José Machado. The next generation of interoperability agents in healthcare.

- International journal of environmental research and public health, 11(5):5349-5371, 2014.
13. Hugo Peixoto, Manuel Santos, António Abelha, and José Machado. Intelligence in interoperability with aida. In *International Symposium on Methodologies for Intelligent Systems*, pages 264-273. Springer, 2012.
  14. Fernando Marins, Luciana Cardoso, Filipe Portela, Manuel F Santos, António Abelha, and José Machado. Improving high availability and reliability of health interoperability systems. In *New Perspectives in Information Systems and Technologies, Volume 2*, pages 207-216. Springer, 2014.
  15. Renato Fileto and Claudia Bazer Medeiros. A survey on information systems interoperability. Technical Report IC-03-030, 2003.
  16. Nir Menachemi and Taleah H Collum. Benefits and drawbacks of electronic health record systems. *Risk management and healthcare policy*, 4:47, 2011.
  17. Júlio Duarte, Maria Salazar, César Quintas, Manuel Santos, José Neves, António Abelha, and José Machado. Data quality evaluation of electronic health records in the hospital admission process. In *2010 IEEE/ACIS 9th International Conference on Computer and Information Science*, pages 201-206. IEEE, 2010.
  18. Júlio Duarte, Sara Castro, Manuel Santos, António Abelha, and José Machado. Improving quality of electronic health records with snomed. *Procedia Technology*, 16:1342-1350, 2014.
  19. Júlio Duarte, Carlos Filipe Portela, António Abelha, José Machado, and Manuel Filipe Santos. Electronic health record in dermatology service. In *International Conference on ENTERprise Information Systems*, pages 156-164. Springer, 2011.
  20. Ken Peers, Tuure Tuunanen, Marcus A Rothenberger, and Samir Chatterjee. A design science research methodology for information systems research. *Journal of management information systems*, 24(3):45-77, 2007.
  21. Alan R Hevner, Salvatore T March, Jinsoo Park, and Sudha Ram. Design science in information systems research. *Management Information Systems Quarterly*, 28(1):6, 2008.
  22. Carl Lawrence, Tuure Tuunanen, and Michael D Myers. Extending design science research methodology for a multicultural world. In *IFIP Working Conference on Human Benefit through the Diffusion of Information Systems Design Science Research*, pages 108-121. Springer, 2010.
  23. José Dias. Analysis of Design Science Research Methodology and Entrepreneurship Connections. PhD thesis, 07 2013.
  24. Guido L Geerts. A design science research methodology and its application to accounting information systems research. *International Journal of Accounting Information Systems*, 12(2):142 - 151, 2011.
  25. Mohamed Arezki Mellal. Obsolescence -a review of the literature. *Technology in Society*, 63:101347, 2020.
  26. Oluwatomi Adetunji, John Bischoff, and Christopher J Willy. Managing system obsolescence via multicriteria decision making. *Systems Engineering*, 21(4):307-321, 2018.
  27. Nikhil P Joshi, Frank W Stahnisch, and Tom W Noseworthy. Reassessment of health technologies: obsolescence and waste. 2009.
  28. Paul Vick and Lucian Wischik. The microsoft visual basic language specification. Microsoft Corporation, 2007.
  29. Félix Díazz Ortega. Conversión de Aplicación de entorno gráfico de Visual Basic a Java. PhD thesis, Universitat Politècnica de València, 2015.
  30. James Gosling, David Colin Holmes, and Ken Arnold. *The java programming language*, 2005.
  31. Bill Joy, Guy Steele, James Gosling, and Gilad Bracha. *The java language specification*, 2000.



## **Aims and Objectives**

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