# Workplace Benchmarking: current benchmarking practice of the real estate industry and benchmarking demands of corporate real estate organisations

Virna Monero Flores Zurich University of Applied Sciences virna.moneroflores@zhaw.ch

Eunji Häne Zurich University of Applied Sciences eunji.haene@zhaw.ch

#### ABSTRACT

Through benchmarking, organisations can discover business insights and turn data into actionable outcomes to increase business performance. This study looks into the experience of corporate real estate (CRE) organisations with workplace benchmarking, aiming to better understand the current benchmarking practice and the benchmarking demands of organisations with large corporate real estate portfolios. In this qualitative explorative study, we conducted 10 semi-structured interviews with CRE and workplace managers, and one group interview with four CRE and workplace management consultants from Switzerland and Germany. Most participants work in large national organisations (n=2) or at multinationals (n=8) and represent various industries, including pharmaceuticals, consulting, software, telecommunications, transportation, banking and insurance. Data was analysed through thematic coding. We uncovered some underlying themes that describe the current practice and the demands for workplace benchmarking of CRE organisations. We identified three key aspects: 1) added value of benchmarking ("workplace benchmarking: part of the raison d'être of CREM"), 2) barriers for benchmarking implementation ("lack of systematic methods", "missing standardisation, comparability, uniformity", "different standards for data quality", "measuring remains a challenge", "passive use of data"), and 3) benchmarking demands ("need for holistic benchmarking"). This study showed that although it is recognized that benchmarking is valuable to give insights into the effectiveness of the strategy, organisations struggle with the implementation, due to missing standardisation and the lack of systematic methods. These findings can inform the development of CRE benchmarking solutions regarding industry demands, especially for the creation of workplace benchmarking tools. Additionally, this study investigated the benchmarking practice and demands of CRE organisations during the transition from "home-office mandates" to "return to the office", triggered by the COVID pandemic around summer 2021, giving insights into how CRE organisations have been using data and benchmarking to support the decision to optimise their workplace strategies.

#### Keywords

Workplace benchmarking, Benchmarking practice, Corporate real estate.

## **1 INTRODUCTION**

As part of a research project on workplace benchmarking, we conducted a qualitative interview study, where we asked corporate real estate practitioners and real estate and workplace consultants about their experience with workplace benchmarking. Our research aim was to better understand the current benchmarking practice and the benchmarking demands of organisations with large real estate portfolios. The interview study took place in summer 2021

and is part of a larger research and development project that seeks to develop a standardised methodology and the tools to gather and analyse workplace benchmarking data, to measure workplace performance.

### 2 THEORY

Over the last few years, companies have increasingly transitioned to new working practices supported by innovative workplace concepts (Riratanaphong and van der Voordt, 2015). This has sparked an interest in the added value of the workplace for businesses (Petrulaitiene and Jylhä, 2015; Riratanaphong and van der Voordt, 2015). At the same time, the increasing pressure to efficiently use space, which can be the second highest cost factor for organisations (Commission for Architecture & the Built Environment, 2005; Steiner, 2006; Miller et al., 2014), motivates executive management to demand specific metrics to measure this added value (Jones Lang LaSalle, 2019). Yet, measuring the added value and impact of facilities on the business can be a challenge. Several authors (e.g., Riratanaphong et al., 2012; Jensen and van der Voordt, 2016; van der Voordt and Jensen, 2018) have studied the phenomena and focused on defining the added value of Facility Management (FM) and Corporate Real Estate (CRE) for organisations, with emphasis on work environments and on identifying value-adding parameters in buildings. They focus on the extent to which buildings, facilities and services are aligned with organisational needs. Building on this, Hoendervanger et al. (2016) identified interventions, tools and indicators to measure the added value of these building parameters. Riratanaphong and van der Voordt (2015) presented a study on the added value of workplaces and instruments to measure its performance, and found that organisations did not implement performance measurement systems due to poor practical applicability, although the organisations have a certain awareness of which performance criteria to measure. The authors recommend benchmarking as an approach for performance measurement. Similarly, benchmarking is considered a relevant instrument for quality measurement and performance improvement for Corporate Real Estate Management (CREM) (e.g., Jensen and van der Voordt, 2017; van der Voordt and Jensen, 2018). Measuring the added value of the workplace can entail measuring the quality of office environments through the integration of data from the building, the users (e.g., behaviour, assessments, and outcomes like health and productivity), and the operative building management processes. Also, the impact of the workplace on employee performance, work/life balance and employee retention are acquiring more attention, as drivers of workspace innovation are drifting from cost centric approaches to user-centred outcomes (Creighton, 2014, as cited in Kämpf-Dern & Konkol, 2017). This increases the focus on the impact of the workplace on employee satisfaction, talent attraction and retention and drives the need for workplace performance measurement. Furthermore, the COVID-19 pandemic has changed the way offices are used, the location of work (Naor et al., 2021), and increased the need for measuring workplace impact. Yet methodological challenges remain, and organisations lack guidance for implementing measurement solutions. Støre-Valen and Lohne (2016) identified methods to assess building performance and found these methods had a limited scope as they focused only on one aspect of the building. Also, Tagliaro (2018a) proposed a system of performance indicators for strategic design, management and use of offices, highlighting the need for frameworks to align the functional areas related to workplace performance (Tagliaro, 2018b). Zhou et al. (2019) and Tagliaro et al. (2021) also found gaps in the methods used to collect space utilisation data, indicating the need for guidelines for workplace data collection. Benchmarking, as a process that seeks to establish the potential for improvement in an organisation through systematic performance comparison across peers and industries (European Committee for Standardisation, 2012), enables organisations to discover business insights and turn data into actionable outcomes to increase performance.

Benchmarking helps organisations discover best practices set in the context of their business environment and gives them orientation of where the market is heading to, helping them identify levers to optimise their business practices. In this sense, workplace benchmarking can be an alternative to provide reference indicators of how different office concepts function in practice and deliver measures of the impact of the workplace on the business and optimization possibilities. Yet for a long time, practical applications of workplace benchmarking have been limited to financial and space indicators (Massheder and Finch, 1998, as cited by Stoy & Kytzia, 2005, p. 19), leading to efficiency driven decision making, without focusing on the human-centric approach needed for the high performing workplace (e.g., Kämpf-Dern and Konkol, 2017). The development of benchmarking has been hindered by multiple factors such as lack of resources, lack of technical knowledge in planning benchmarking projects, benchmarking partners, lack of understanding of benchmarking, management commitment and fear of sharing information are barriers to implementing benchmarking (Adebanjo et al., 2010). Yet, in the last decade, new multidimensional approaches to measure and benchmark workplace performance are emerging. Customer and end-user related measurements have been given more importance: for example, indicators of satisfaction, quality and effectiveness of service delivery in the workplace were suggested as possible end-user related measurements to monitor (Shamma and Hassan, 2013). Van der Voordt and Jensen (2017) also proposed measuring spatial and cost factors in combination with employee outcomes and design features of the office space. Kämpf-Dern and Konkol (2017) suggested integrating organisational factors (e.g. human resources, strategic goals, change factors) together with company specific performance-based actions to create high performing workplaces, and indicated the need for performance evaluation systems with context and organisation specific performance parameters. Furthermore, a continuous process that demands monitoring and optimization of the workplace performance can ensure a high performing office environment, which is why benchmarking can be an integral part of the corporate workplace strategy (Kämpf-Dern and Konkol, 2017). This evidence indicates that a holistic benchmarking solution is required.

## **3 METHODOLOGY**

To profile the benchmarking demands and practice within the companies, we conducted ten semi-structured interviews with CRE and workplace management practitioners, and one group interview with four real estate and workplace management consultants.

## 3.1 Participants

A total of ten participants participated in individual interviews. Most participants work in large organisations, either at a national level (n=2) or at a multinational level (n=8); they represent different industries, including pharmaceuticals (n=3), banking and insurance (n=2), consulting (n=2), transportation (n=1), software development and telecommunications (n=2). Eight participants are based in Switzerland, one in Germany, and one in the USA. Five participants work in workplace management and four participants work in real estate management. Only one participant works in data management. Four real estate and workplace management consultants are from Switzerland (n=3) and Germany (n=1) and participated in one group interview.

#### 3.2 Data collection

Participants were recruited through purposive sampling (Battaglia, 2008). An email invitation and a project information flyer were sent to 20 experts, out of which we recruited ten participants. The interviews were semi-structured following a predefined interview guideline, but follow-up questions were asked if the interviewee mentioned relevant information for the research. The interview had two parts: general aspects of benchmarking and relevance of the KPIs developed in the project. Definition and description of KPIs were provided to participants before conducting the interview. Each participant had an individual interview in German (n=9) or English (n=1), conducted online (via ZOOM and MS-Teams) between July and August 2021 by the two authors. The interviews were recorded via video format and lasted from 50 minutes to one hour. Participants of the group interview were recruited by the industry partner. To determine consultants' perspectives about workplace benchmarking, participants were asked for their opinions on drivers and barriers of benchmarking, benchmarking in the consulting process, approaches to benchmarking and KPIs. The group interview was conducted online (via MS-Teams) in September 2021 and lasted two hours. The digital white board *Miro* was used as a tool for the group interview; participants could add notes to each discussion topic directly on the online board. Each discussion topic lasted between 5-15minutes. The group interview was protocolled through concurrent note taking by an observing member of the project team and documented as an interview protocol together with the notes from participants in the digital white board. All quotes not originally in English have been translated by the authors.

## 3.3 Data analysis

The 10 interviews were selectively transcribed (not verbatim transcriptions; Azevedo et al., 2017; Altheide et al., 2003) and summarised in interview notes. Thematic analysis was used to identify patterns (themes) in the data, following step 1 to 5 of the framework by Braun and Clarke (2006). Both authors individually read the interview notes and generated initial codes of the selectively transcribed data. Then they identified the emerging themes by collating common codes across participants. After each step, a discussion between the two authors was conducted to resolve any interpretative differences. Finally, prevailing themes were compiled into a matrix. Codes from the group interview were added into the matrix by one author. All quotes not originally in English, have been translated by the authors.

## 4 **RESULTS**

We uncovered seven underlying themes that describe the current practice and the demands for workplace benchmarking of CREM organisations, that can be grouped into three key groups: **1) added value of benchmarking** ("workplace benchmarking: part of the raison d'être of CREM"), **2) barriers for benchmarking implementation** ("lack of systematic methods", "missing standardisation, comparability, uniformity", "different standards for data quality", "measuring remains a challenge", "passive use of data"), and **3) benchmarking demands** ("need for holistic benchmarking"). The study showed that although the added value of benchmarking for the business is widely recognized, organisations struggle with the implementation of benchmarking, due to missing standardisation and the lack of systematic methods.

1. Workplace Benchmarking: part of the raison d'être of CRE. Benchmarking is recognized as a method to generate value for the core business and the office users. "[Our driver] is to influence the performance of the business with the workplace" (Participant 5, Pharma); "[Our driver] is to generate added value for the core business" (Participant 6, Pharma). Benchmarking helps CRE units to define the value of their function for the organisation and helps them provide arguments to the general management for decision making about the real estate portfolio. Benchmarking and the data behind it have been defined as the raison d'être of CRE as it provides valuable information about the portfolio and the effectiveness of the current strategy. "Benchmarking is part of our reason for existing" (Participant 3, Telecom); "We need benchmarking to deliver arguments to the management" (Participant 4, Transportation); "We need to deliver arguments to management to demonstrate why we need the space resources" (Participant 7, Pharma); "[Benchmarking] is not a priority because we want it, it is a basic principle to continue being relevant" (Participant 10, Software).

Concretely, participants reported that they need to gain insights on user satisfaction and measurements about the efficiency of their portfolios. Additionally, the disruption caused by the COVID-19 pandemic generated large management attention on workplace metrics. The need to optimise utilisation of the office space and support the new needs of workers has gained increased importance, which drives CRE to turn to benchmarking to support decision making. The results showed the complexity of implementing benchmarking is a common challenge for all participants. Moreover, some participants indicated data security, and data transparency as a challenge. Theme two to six give a deeper dive into the barriers that hinder the adoption of benchmarking, showing that these relate to the conceptual approach to structure benchmarks and to the methods and tools used for collecting and processing data.

**2. Lack of Systematic Methods.** Participants emphasised the lack of systematic benchmarking solutions. Most of them reported that they do not follow any concrete approach to benchmarking: "We do internal benchmarking. Although we don't do it systematically and it is not coordinated globally" (Participant 2, Consulting). The benchmarking practice in the organisations of the participants has mostly grown organically and follows internally developed concepts for data aggregation. Most organisations also rely on internally developed tools, which makes the comparison across external peers challenging. "[We don't have...] any systematic methods, but we have an excel based cockpit" (Participant 8, Insurance); "[The method for benchmarking is] our own creation based on Excel" (Participant 4, Transportation); "There are not the right tools available." (Participant 1, Banking). Additionally, participants reported the industry is lacking standards on how to consolidate the volume of data, how to aggregate the diverse sources and types of data and transfer this information into relevant business insights to optimise the portfolio.

**3. Missing Standardisation, Comparability, Uniformity.** At the core of benchmarking lies comparison, for which the comparability of peers is essential to any benchmarking system. The lack of standardisation, comparability, and uniformity of the measurements was highlighted by the participants as one of the biggest challenges for the implementation of benchmarking. They specified that missing standards result in big variation in choice and calculation approaches for metrics, variations in measurement practice across regions and inconsistencies in how organisations define the variables to be measured. Participants reported the need for standardisation, not only to enable quantitative comparisons, but also to enable the comparison of qualitative factors to set the data in context. "[Our demand is] to be uniform and standardised, so that the comparison is possible" (Participant 8, Insurance); "[Our demand is] to be qualitatively comparable. That means that the context factors should be similar" (Participant 3, Telecom); "You can't know if you are the best without external benchmarks. But the benchmarks are not comparable" (Participant 3, Telecom); "[It is a barrier] when data can't be applied because everyone measures differently" (Participant 4, Transportation).

**4. Different Standards for Data Quality.** The quality of current benchmarking approaches was questioned by the participants. They reported that overall, the quality of benchmarking is not good enough and that many benchmarking solutions are not well structured: "We have seen a lot, read a lot, and compared a lot, but those were not good experiences regarding quality. The topic is not structured enough to get good benchmarks" (Participant 3, Telecom). Additionally, many of the available data sources have varying and inconsistent accuracy levels which affect precision and quality of data. Besides, within the individual organisations, these demands for data quality are widely different as organisations value different levels of precision: "It is really ineffective because data quality is not same across companies" (Participant 5, Pharma).

**5. Measuring Remains a Challenge.** Even though the technical possibilities for data collection are advancing, participants reported that measurement remains challenging, specifically, the

measurement of combined metrics (from the space utilisation, employee data and space design) to get insights, not only about the space, but also about the users. Most participants recognized the added value of such metrics, but they report that in order to combine qualitative and quantitative information about the portfolio which considers both the space and the users, new measurement approaches are required. "Building data is available almost to the minute but data from the users is only available with delay. In surveys a lot gets lost. The data have a different time horizon" (Participant 1, Banking); "Many things can influence a survey. There are too many questions and people burn out; surveys are too long" (Participant 5, Pharma); "There are links between these combined metrics, but it is hard to measure them. The influencing mechanisms are very subtle" (Participant 8, Insurance); "I don't know any methods to measure this other than surveys. Space utilisation in combination with employee performance would be interesting" (Participant 7, Pharma).

6. Passive Use of Data. Another challenge that surrounds benchmarking practice is turning data into actionable business insights. Most participants reported that they have measurement systems in place and actively collect data on their portfolios, nevertheless, the data is used passively, mostly ad-hoc, as organisations lack the resources to actively transfer data into actionable business knowledge. For example: "[The data] is available daily but no one is looking at it currently" (Participant 1, Banking). This turns benchmarking into a passive source of information that is not always acted upon: "We use benchmarking for information but not for direction" (Participant 5, Pharma). For this reason, organisations have not yet exploited the potential for benchmarking.

7. Demand for New Solutions: Need for Holistic Benchmarking. Participants reported that the focus of their real estate related measurements is shifting from space efficiency to more user related measurements. Main topics that are gaining increased attention are user satisfaction, user performance (productivity), user health and wellbeing, talent retention and user experience: "It is becoming increasingly important what happens outside the Workplace Metrics" (Participant 6, Pharma); "As an organisation, we are in a shift: we don't care about space or workstations, we care about people" (Participant 10, Software). They report the trend is shifting to more integrated measurement solutions, especially in collaboration with other enabling business functions, like human resources and information technology: "If we link space quality and productivity and there is a correlation, the added value is very high" (Participant 3, Telecom); "I need to have the benchmark as information, how does the interaction work (with data from HR and IT, and feedback from everyone in the organisation)" (Participant 10, software). Participants reported the need for holistic benchmarking solutions that focus on combined metrics: "In the past everything was about cost per square metre, today everything is viewed more holistically" (Participant 6, Pharma); "The aim is to get out of the survey business and create more holistic metrics" (Participant 5, Pharma). They indicated single key indicators are not to derive actionable insights. They indicated the key is in the power of combined information. In conjunction with experience, knowledge and intuition, benchmarking is a valuable tool to show the direction in which the real estate portfolio is heading.

## 5 **DISCUSSION**

The results of our interview study are consistent with the discussion in the literature. The interest in measuring the added value of the workplace to the business (Petrulaitiene and Jylhä, 2015; Riratanaphong and van der Voordt, 2015) is still an ongoing trend as our study showed that CRE units are continuously aiming to generate business impacts. Our study showed advancements regarding the scope of measurement, and that companies are willing to be more holistic about measuring and go beyond space and financial metrics and adopt a more user

centric approach to measure workplace performance, as suggested by Shamma and Hassan (2013), Kämpf-Dern and Konkol (2017) and Van der Voordt and Jensen (2017). Nevertheless, the lack of adequate instruments (e.g., Riratanaphong and van der Voordt, 2015; Støre-Valen and Lohne, 2016, Zhou et al., 2019; Tagliaro et al. 2021) continues to challenge the implementation of benchmarking. Our findings suggest there is a disconnection between the perceived importance of benchmarking and the actual business practices to implement it. The timing of this study (i.e., with ongoing remote work mandates in summer 2021) could have influenced the forward attitude towards benchmarking reported by participants, as the pandemic confronted organisations with the shortcomings to their monitoring systems. Nonetheless, the understanding that benchmarking is key to measure business performance has long been a core business principle that is not yet widely implemented, at least not in a structured manner, by CRE units and the CRE industry. Although this qualitative study makes it difficult to generalise, the findings suggest that the CRE industry is still lacking solutions that are feasible for implementation. The findings show there is a need for benchmarking solutions that enable organisations to measure workplace performance, to standardise workplace processes and data collection, to increase transparency and comparability, and to generate evidence-based management theories of how the workplace generates business impact beyond the borders of each organisation to move workplace theory forward.

## 6 CONCLUSION

This paper presented an interview study in which the experiences of workplace and real estate experts with benchmarking were elicited. It was shown that while the added value of benchmarking as a method for measuring the added value of the workplace to the business is widely recognized, the lack of systematic, standardised methods hinders the implementation. The disruption brought by the COVID-19 pandemic has fundamentally changed the business practices of CRE units and highlighted the importance of workplace metrics to support decision making. On the one hand, this study shows the shortcomings that real estate markets are dealing with in terms of methods to measure workplace performance. On the other hand, it shows that the ongoing disruption offers an unprecedented chance to encourage the discussion of evidence-based solutions which measure the value of the workplace to the business.

## ACKNOWLEDGMENTS

The authors thank the project team for their feedback to set up the study and their support to recruit interview participants. Additionally, we thank our team colleagues for their feedback on this manuscript. This research was co-financed by Innosuisse – Grant: 53085.1 IP-SBM.

#### REFERENCES

- Adebanjo, D., Abbas, A., Mann, R. (2010), "An investigation of the adoption and implementation of benchmarking", *International Journal of Operations & Production Management*, 30, 11, 1140-1169. <u>https://doi.org/10.1108/01443571011087369</u>
- Altheide, D., Johnson, J., Bloom, L., Lahey, M., Bloor, M., Burgess, R., Clavarino, A., Najman, J., Silverman, D., Cobb, A., Hagemaster, J., Cook, G., Corbin, J., Strauss, A., Crabtree, B., Miller, W., d'Agincourt-Canning, L., Cox, S., Daly, J., West, P (2003) "Transcription quality", Holstein, J and Gubrium, J (Eds.), *Inside Interviewing*, SAGE Publications, Thousand Oaks, CA, 266-287. <u>https://dx.doi.org/10.4135/9781412984492</u>
- Azevedo, V., Carvalho, M., Costa, F., Mesquita, S., Soares, J., Teixeira, F., Maia, Â. (2017), "Interview transcription: conceptual issues, practical guidelines, and challenges", *Revista De Enfermagem Referência*, 4, 14, 159–168. https://doi.org/10.12707/RIV17018

- Battaglia, M.P. (2008), "Purposive Sample", Lavrakas, P.J. (Ed.), *Encyclopaedia of Survey Research Methods*, SAGE Publications, Thousand Oaks, 524-525. https://doi.org/10.4135/9781412963947
- Braun, V., Clarke, V. (2006), "Using thematic analysis in psychology", *Qualitative Research in Psychology*, 3, 2, 77–101. <u>https://doi.org/10.1191/1478088706qp063oa</u>
- Commission for Architecture & the Built Environment (2005), "The impact of office design on business performance", available at: <u>https://www.designcouncil.org.uk</u> (accessed 25 March 2022)
- European Committee for Standardisation (2012), Facility Management Part 7: Guidelines for Performance Benchmarking (European Standard No. BS EN 15221-7:2012). https://www.en-standard.eu/bs-en-15221-7-2012-facility-management-guidelines-forperformance-benchmarking/
- Hoendervanger, J. G., Bergsma, F., van der Voordt, T. (2016), "Tools to manage and measure adding value by FM and CREM", van der Voordt, T. & Jensen P. A. (Eds.), *Facilities management and corporate real estate management as value drivers: How to manage and measure adding value*, Routledge, London, 299–322.
- Jensen, P.A., Van der Voordt, T. (2016), Facilities management and corporate real estate management as value drivers: How to manage and measure adding value, Routledge, London
- Jones Lang LaSalle (2019), "Benchmarking 101: Why all the fuss?", available at: <u>https://www.us.jll.com/en/views/benchmarking-101-why-all-the-fuss</u> (accessed 25 March 2022).
- Kämpf-Dern, A., Konkol, J. (2017), "Performance-oriented office environments framework for effective workspace design and the accompanying change processes", *Journal of Corporate Real Estate*, 19, 4, 208–238. <u>https://doi.org/10.1108/JCRE-03-2017-0009</u>
- Massheder, K., Finch, E. (1998), "Benchmarking methodologies applied to UK facilities management", *Facilities*, 16, 3/4, 99–106. <u>https://doi.org/10.1108/02632779810205639</u>
- Miller, R., Casey, M., Konchar, M. (2014), *Change Your Space, Change Your Culture: How Engaging Workspaces Lead to Transformation and Growth*, Wiley, New York.
- Naor, M., Pinto, G. D., Hakakian, A. I., Jacobs, A. (2022), "The impact of COVID-19 on office space utilisation and real-estate: a case study about teleworking in Israel as new normal", *Journal of Facilities Management*, 20, 1, 32-58. <u>https://doi.org/10.1108/JFM-12-2020-0096</u>
- Petrulaitiene, V., Jylhä, T. (2015), "The perceived value of workplace concepts for organisations", *Journal of Corporate Real Estate*, 17, 4, 260-281. <u>https://doi.org/10.1108/JCRE-06-2015-0014</u>
- Riratanaphong, C., van der Voordt, T., Sarasoja, A. (2012), "Performance measurement in the context of CREM and FM", Jensen, P.A., van der Voordt, T., & Coenen, C. (Eds.), *The Added Value of Facilities Management: Concepts, Findings and Perspectives,* Polyteknisk Forlag, Lyngby
- Riratanaphong, C., van der Voordt, T. (2015), "Measuring the added value of workplace change: Performance measurement in theory and practice", *Facilities*, 33, 11/12, 773-792. <u>https://doi.org/10.1108/F-12-2014-0095</u>
- Shamma, H., Hassan, S. (2013), "Customer-driven benchmarking", *Benchmarking: An International Journal*, 20, 3, 377–395. <u>https://doi.org/10.1108/14635771311318144</u>
- Steiner, J. (2006), "The art of space management", *Journal of Facilities Management*, 4,1, 6–22. <u>https://doi.org/10.1108/14725960610644195</u>
- Stoy, C., Kytzia, S. (2005), "Office building efficiency and capacity benchmarks", Facilities, 23, 1/2, 16–30. <u>https://doi.org/10.1108/02632770510575875</u>

Støre-Valen, M., Lohne, J. (2016), "Analysis of assessment methodologies suitable for building performance", *Facilities*, 34, 13/14, 726-747. <u>https://doi.org/10.1108/F-12-2014-0103</u>

Tagliaro, C. (2018a), A Place for the Workplace to Work. A system of performance indicators for strategic design, management and use of the workplace [unpublished doctoral

- *dissertation]*, Politecnico di Milano, Milan. Tagliaro, C. (2018b), "Workplace performance in Italy: key indicators from key users", paper presented at Transdisciplinary Workplace Research Conference, 19-21 September, Tampere.
- Tagliaro, C., Zhou, Y., Hua, Y. (2021), "A change in granularity: measure space utilisation through smart technologies", *Facilities*, 39, 1/2, 64-79. <u>https://doi.org/10.1108/F-08-2019-0093</u>
- Zhou, Y., Tagliaro, C., Hua, Y. (2019), "From Hour to Minute: Non-technical Challenges for Measuring Office Space Utilisation with Smart Technologies" Paper presented at CIB World Building Congress 2019 'constructing smart cities', 17-21 June, Hong Kong.
- van der Voordt, T. J.M., Jensen, P. A. (2018), Measurement and benchmarking of workplace performance. Journal of Corporate Real Estate, 20(3), 177–195. https://doi.org/10.1108/JCRE-10-2017-0032