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Article

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Exploring impact of future flexible working model evolution on urban environment, economy and planning

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ABSTRACT

This paper aims to explore the impact of future flexible working model (FWM) evolution on urban environment, economy and planning. Working models are changing, evolving over several decades towards flexibility and mobility. Major cities are witnessing emerging alternative workplace models, such as coworking spaces, digital working hubs, on-demand spaces, and office clubs. These trends inevitably bring significant changes of flexible working hours, modified workplace business operations, different urban facilities requirements, and new workplace location options. However there remains a lack of understanding of the impact of such flexible modern workplaces on urban development. To address this issue, the current paper adopts a systematic literature review method, discusses the historical evolution and various types of FWM, and explores the impact of such FWMs on urban environment, economy and planning. This research leads to enhanced understanding, planning and management for the future challenges of next-generation working models in major cities, and brings potential direct benefits to urban development and the economy.

1. Introduction

Working models are changing (Ware & Grantham, 2003), evolving over several decades towards flexibility and mobility. Future work is fundamentally dependent on knowledge (Becker, 2007). Major cities are witnessing the emergence of alternative workplace models such as coworking spaces, digital working hubs, on-demand spaces, and office clubs. This trend toward a flexible working model (FWM) inevitably is a significant impact on the economy and environment, as well as future urban design/planning. Along with the working model changes, the organisational structures, character of the workforce, and tools used to do work are also being updated (Chan, Beckman, & Lawrence, 2007). For instance one particular type of FWM, the coworking business model, are being adopted in corporate real estate management, providing further agility and flexibility for larger corporate organisations, and achieving higher densities and utilisation rates (Garrett, Spreitzer, & Bacevice, 2017). It is considered to improve the exchange of knowledge among members, and foster more collaborative practices that can drive innovation (Jakonen, Kivinen, Salovaara, & Hirkman, 2017) as well as cost savings (Bentley et al., 2015). Further, such flexible workplace arrangements could play an important role in contributing to reducing traffic congestion by assisting with travel demand management. Ge, Polhill, and Craig (2018) studied various workplace-sharing programmes to explore how coworking and travel behaviours interact. The results suggest that adopting workplace sharing in large organisations can result in tangible benefits for reducing congestion and pollution from transport, specifically reducing both commuting times and CO² emissions.

However, despite the clear demand for continual development along such modern directions, there is a lack of understanding

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about flexible workplaces and their impact. This study aims to explore the impact of such changes on urban environment, economy and planning, based on a systematic literature review and discussion. This paper commences with the historical evolution of the FWM, followed by systematic review method, introduction of various types of FWMs, and recent studies on FWMs. The next section discusses the impact of FWM on urban environment, economy and planning. This paper concludes with design/planning guidelines to accommodate the future flexible working trend.

2. Historical evolution of the flexible working model (FWM)

Workplaces and workstyles have significantly developed over the past three decades, as a result of the increasingly profound impact of advancing technologies (Harris, 2015), the ongoing evolution of information and communication systems, changing organisational structures, and changing work requirements (Göçer, Göçer, Ergöz Karahan, & İlhan Oygür, 2018). This section describes the historical evolution of FWM, through the origin, development, and boom period of FWM.

2.1. Origin of FWM – “Telecommuting” and “Activity-based workplace” concepts

The first flexible working concept was proposed by Jack Nilles, by defining the term “telecommuting” in the 1970s, when he was working remotely on a complex NASA communication system. Nilles progressed the teleworking and telecommuting trend, from the perspective of traffic reduction, organisation benefit, etc. (Nilles, 1975, 1988). In the 1980s, telecommuting expert Gil Gordon started his consulting business to assist companies to have telecommuting programmes; he organised the *TELECOMMUTE* conference from 1992 to 1998, which had important impacts in the field. Mokhtarian and her collaborators (Koenig, Henderson, & Mokhtarian, 1996; Mokhtarian, Center, & University of California, 1992) conducted a transportation evaluation in Southern California and discussed the potential changes in travel and emission impacts, residential location, and activity patterns due to telecommuting. In 1993, the *International Telework Association and Council* was founded, later renamed to *Telework Coalition*, to promote telework with aims of improving work-life balance, increasing employment opportunities, and reducing traffic and associated pollution. Since 2000, following the wide adoption of advanced personal computers and the internet, telecommuting has become increasingly popular among large companies all over the world.

Veldhoen (1995) proposed the concept of the “activity-based workplace”, where employees' workplace is based around their activities rather than staying at a single workstation the whole day. Such attempts at new workplace strategies and innovative “flexible” office concepts were adopted by a number of Dutch organisations. Meanwhile, several attempts toward flexible workplaces emerged worldwide at organisations such as *Steelcase*, *IBM*, *Johnson Controls*, *Chiat/day*. Such organisations expect that approach could increase employee efficiency and satisfaction. For instance, it is expected that shared workspaces and desk rotation could provide an effective way to achieve cost reductions through more efficient use of space (Maarleveld, Volker, & Van Der Voordt, 2009).

From that point on, organisations and companies made efforts to better align their workplaces appropriately with the type of tasks being undertaken (Joroff, Porter, Feinberg, & Kukla, 2003). Consequently, the concept of the agile workplace has been gaining traction over more traditional static organisational structures (Harris, 2015). Workplace design, planning and management processes have been transforming from traditional static backdrops for routine solitary work, to new “flexible” and “hotel-style” facilities that provide a more suitable level of service for workers.

2.2. Development of FWM – Emergence of the “Coworking space”

The growing interest around flexible workplaces has led to an increase in studies investigating various forms of flexible workplaces. Besides expanding the flexibility within individual corporations, in recent years alternative flexible workplaces such as “coworking spaces” are emerging, which provide freelance startups and remote workers with a new working model. Coworking spaces provide a mixture of open physical space, beneficial characteristics (community, flexibility, social ties) and efficient workplace attributes (shared managed wi-fi, IT security, and consistently available space), potentially facilitating greater opportunities for business collaboration and innovation (Garrett et al., 2017).

The first attempt at adopting a coworking space method, was established by Brad Neuberg in 2005, driven by a lack of productivity while working from home in an absence of business centre social interaction. Neuberg and his friends established the *San Francisco Coworking Space* at Spiral Muse, which is regarded as the first coworking space (Spinuzzi, 2012). Following that coworking spaces developed rapidly; in 2006 there were over 700 coworking spaces all over the world. Next, coworking spaces evolved into a “membership-based” model, allowing members to prepay for a defined membership period during which they can access the coworking space's facilities and services. Some of the main benefits include more efficient adoption of shared up-to-date technologies, increased opportunities for micro-businesses and independent workers, and provision of clubs where workers can effectively work either alone or interact with others (Garrett et al., 2017). *DeskMag* (2018) suggests that the number of coworking spaces and members has been growing steadily. Companies such as *Wework* (www.wework.com) manage a global network of coworking spaces across hundreds of locations in 72 cities, 24 countries, with over 175,000 members in 2017. The online portal *Coworker* (www.coworker.com) is a large coworking directory, which contains links to more than 7000 coworking spaces across 125 countries.

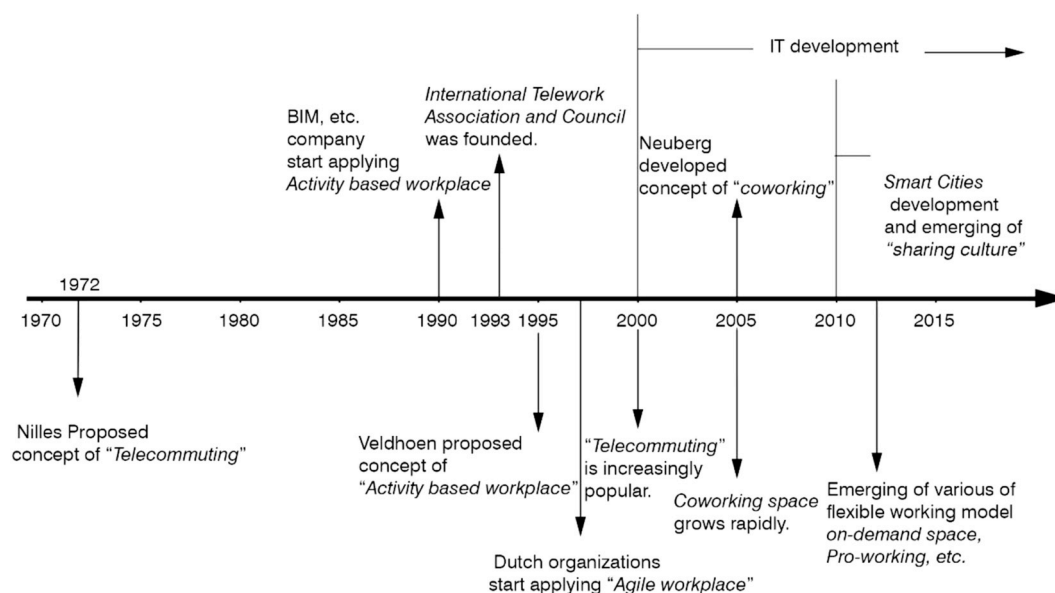


Fig. 1. Historical evolution of FWM.

2.3. Booming of FWM – New trends towards smart cities and a sharing culture

Given the increasing worldwide interest in the advanced concept of ubiquitous cities or "smart cities", people are expecting to be increasingly enabled by information and communication technologies to do anything, anywhere, at any time (Nedovic-Budic & Williams, 2013). This is opening more opportunities for a variety of FWMs to merge into the urban environment. Meanwhile, "sharing culture" has become an increasingly popular phenomenon recently. Such sharing culture means to share resources, time, services, knowledge, and information within a region to achieve a more sustainable, resourceful and socially engaging lifestyle (Katrini, 2018). Typical examples are the emergence of bike sharing, house exchange, childcare coops, etc. In terms of sharing workplaces, besides the booming of membership-based coworking spaces, there are also "on-demand workspaces" emerging which are flexible and convenient. On-demand workspaces are designed for people who will use a workspace infrequently, or teams only working on a particular project. The workplace fees can be hourly/daily/monthly/yearly based, and the price may also be variable due to changes in demand. Users can book a desk, meeting room, small office area, etc. The level of flexibility is high in on-demand workplaces. A typical example of an on-demand workplace is *LiquidSpace*, which is an online platform where people can book a workplace according to their requirements anytime online, across more than 500 cities in the US, Canada and Australia. Other types of flexible workplace models also include pro-working, office club, digital working hubs, etc. These new trends are blurring the boundaries between companies, and providing people with a variety of new working models brought on by the benefits of smart cities. Fig. 1 summarises the historical evolution of FWM.

3. Methodology – Systematic literature review

A semi-systematic quantitative literature review was conducted to identify the most important flexible working models, by systematically searching and categorising the relevant literature. The review focuses on the studies related with teleworking and coworking. Based on the result of this review, a list of the most important FWMs were determined, to be used for exploring the impact of such FWMs on the urban environment, economy and planning. The steps of the systematic quantitative literature review are detailed in the following sections:

3.1. Systematic review protocol

To identify the impact of flexible working models on the urban environment, economy and planning, a semi-systematic quantitative literature review was conducted based on the protocol developed by the Preferred Reporting Items for Systematic Review Recommendations (PRISMA) (Moher, Liberati, Tetzlaff, Altman, & The, 2009) and following the steps outlined in Pickering and Byrne method (Pickering & Byrne, 2014) which has extensively been used in a range of literature review studies (Ballantyne & Pickering, 2015; Guitart, Pickering, & Byrne, 2012; Roy, Byrne, & Pickering, 2012; Steven, Pickering, & Guy Castley, 2011). The results of quantitative review documents (i) where, when, and by whom research was published; (ii) the geographical spread of the literature; (iii) types of methods used; (iv) types of subjects examined; (v) types of variables measured; (vi) different disciplines assessing the topic; and (vii) the types of results obtained (Guitart et al., 2012; Pickering & Byrne, 2014; Roy et al., 2012).

Before the commencement of systematic review steps, the topic for this review was identified and carefully defined as "impact of

FWM on urban development”. The first step identifies what types of questions should be addressed by the literature review, selects appropriate and adequate search keywords, and selects appropriate scholarly databases according to the objective of the review. The next step consists of database search and priority selection. The following step is content assessment and study selection, which involves reading and assessing each publication and stating the process for selecting studies, to ascertain if it is relevant and to help answer the research questions, and whether or not it should be included. Finally, data collection process was performed to describe method of extraction and handling data from reports.

3.2. Research questions, search terms and information sources database

Using a systematic quantitative review technique, this paper assesses the extent of academic literature to answer four research questions:

1. What are the types of flexible working models that exist?
2. Where was research undertaken on flexible working models, who has undertaken the research, and where was it published?
3. What methods were used to investigate the flexible working model?
4. What were the most important impacts to urban development, found from the literature?

Electronic databases were searched to identify original research papers related to ‘flexible working model’. Searches of electronic database included Google Scholar, Web of Science, SCOPUS and Science Direct were used to obtain original research papers published in English language academic journals. In the preliminary stage, the search process has been limited to the term “Flexible working model” to obtain the general research about this field. Then other terms were added as additional keywords for the searches including (“Flexible working model”) as a Title AND (“Telecommuting OR Activity-based workplace* OR Coworking* OR on-demand space* OR Digital Working Hubs* OR Office Clubs**”) as title-abstract-keywords in the database search systems.

Papers involving the topic of original research on flexible working models which have been peer reviewed and published in academic journals were included only. Book chapters along with guidelines and non-academic reports were excluded from the database, however the bibliography from those were utilised to obtain additional academic papers.

3.3. Search strategy and initial selection

A total of “879” papers in English including duplicates were returned by the initial database search process for possible consideration. The database search process was restricted to searching for English-language papers and limited to include only article papers and conference papers excluding thesis, book chapters, and grey literature. Because the concept of flexible workplace emerged in 2007, the period selection for searching of papers for this review was 2007 to 2019. The Zotero software, EndNote X7.7 software, Mendeley software, Jabref software and Microsoft Excel software were all used to support this screening stage. First, the Zotero software was used to transfer the data obtained from google scholar to Endnote. The EndNote software was utilised for organising and managing references, as well as to filter out duplicate papers. Then the Mendeley software helped to transfer the data from Endnote to Jabref software, as well as to identify any duplicate papers which were undetected by the previous Endnote filtering. Finally, the resulting data and information were exported to Microsoft Excel software using Jabref software. The papers and data considered relevant to the research objective were recorded, entered and classified using Excel spreadsheets at each of the stages. At the initial selection stage, the titles and sometimes the abstracts for each paper were read and assessed quickly, in order to ascertain if it was relevant to the research objective, and whether it should be included, and also to aid in screening of duplicate of papers. From this stage, a total of 17 articles were chosen to be included in this review. Table 1 shows the review protocol and the data collected in this and subsequent stages.

3.4. Content assessment, eligibility criteria and study selection

In this step, the summary table of results from the previous step was carefully assessed to document the breadth, depth, and type of published literature on the research topic. For each paper, introduction and conclusion sections of the articles were read to evaluate the content for inclusion.

Papers were equally treated and weighted based on the eligibility criteria for inclusion. The inclusion criteria has been discussed and carefully elucidated to ensure that results are reproducible. Questions were developed to help assess eligibility criteria for inclusion.; the answers to the questions classify if the article should be included or not. At the end of this step, 17 articles remained for inclusion in the review. The questions are presented in Table 1; all answers should be yes to group 1 of the questions, and at least one answer should be positive among group 2 of the questions.

3.5. Data collection process and synthesis of results

The final selected articles were fully read, and information related to the author, study location, working model type, data collection method, research method and research aim were extracted, as presented in Table 1.

Table 1
Review protocol.

Review step	Information collected
Title	Impact of future flexible working model on urban development
Research questions	<ol style="list-style-type: none"> 1. What are the types of flexible working models that exist? 2. Where was research undertaken on flexible working models, who has undertaken the research, and where was it published? 3. What methods have been used to investigate the flexible working model? 4. What were the most important impacts to urban development, found out from the literature?
Search terms used in electronic databases	Flexible workplace model, telecommuting, activity-based workplace, coworking, on-demand space, digital working hubs, office clubs
Electronic databases searched	<ol style="list-style-type: none"> 1. Google Scholar = 96 2. Web of Science = 156 3. ScienceDirect = 166 4. SCOPUS = 461 5. Total = 879
Search strategy and initial selection	<ol style="list-style-type: none"> 1. Author 2. Year 3. Title 4. Abstract 5. Key-words 6. Journal
Content assessment & eligibility criteria	<ol style="list-style-type: none"> 1. Group 1 (all answers yes): <ul style="list-style-type: none"> • Is the publication an original research paper? (yes/no) • Are the objectives of the article clear? • Are the results related to the specific topic and research questions of this study? (yes/no) • Are the main findings of the study clear? (yes/no) 2. Group 2 (at least one answer yes): <ul style="list-style-type: none"> • Does the study involve research about any kind of the flexible workplace model? • Does the study present a methodology for developing a flexible workplace? • Does the study present the impact of the flexible working model?
Data collection process, cross-check and synthesis of results	<ol style="list-style-type: none"> 1. Basic data on the paper <ul style="list-style-type: none"> • Paper titles • Author • Year of publication • Study location 2. Methodological information <ul style="list-style-type: none"> • Workplace model type • Data collection method • Research aim 3. Results <ul style="list-style-type: none"> • Impact of flexible working model

4. Types of FWM and recent studies

Extensive media coverage about distance education, internet-based conferencing, and online commerce, has encouraged a mobile trend away from traditional fixed workplaces, towards more flexible workplaces that bring people, technology and space together (Morrison & Macky, 2017). New FWMs such as coworking spaces, digital working hubs, on-demand spaces, and office clubs are emerging all over the world. In this section, current mainstream FWMs are introduced, followed with recent studies/research on FWM.

4.1. Introduction of current mainstream FWM

4.1.1. Teleworking

The comprehensive definition of teleworking was introduced by Bentley et al. (2016), as “a flexible work arrangement whereby workers work in locations, remote from their central offices or production facilities, with no personal contact with coworkers, but the ability to communicate with co-workers using ICT” (Bentley et al., 2016). Teleworking is also known as telecommuting, remote working, agile working and anywhere working. It is defined as working away from a traditional office or at home, later the definition was amended to involve the use of information and communication technology and virtual work (Coenen & Kok, 2014). The main advantage is that teleworking offers time and spatial flexibility to employees (Pérez, Sánchez, & De Luis Carnicer, 2002).

4.1.2. Coworking spaces

Coworking refers to a diverse group of people working alongside each other sharing a working space and its resources, where freelancers and entrepreneurs can rent desks or offices for a membership fee (DeGuzman & Tang, 2011; Jones, Sundstead, & Bagicalupo, 2009). In such coworking spaces, users may share the office space, kitchens, café, lounges, meeting rooms, etc. An idea promoted by coworking is the bringing together of people who have common interests, to generate innovation, creativity,

entrepreneurship, and an opportunity to create working communities and collaboration (Capdevila, 2013; Garrett et al., 2017). Typically, coworking locations can be found in inner-city suburbs in high-traffic positions. Common benefits of both serviced office and co-working business models include being an important supplement to corporate real estate management, providing further agility and flexibility for larger corporate organisations, and achieving higher densities and utilisation rates (Garrett et al., 2017).

4.1.3. On-demand workplace

The concept of on-demand workplace is similar with hotel booking. Anyone can book online or via a mobile app for a workplace or meeting place quickly based on their demand. Furthermore, companies can list their available space online so that it is possible to maximise usage of the space. For example, the largest on-demand workplace website is “LiquidSpace” (<https://liquidspace.com>); they provide over 18,000 available spaces, across 500 cities across the United States, Canada, and Australia. And they work with more than 6100 venue partners to allow them list their available work space. Advantages of the on-demand workplace are its flexibility and optimisation of space usage.

4.1.4. Digital working hubs

Digital working hubs are specialised counterparts of coworking spaces. These high-tech next-generation collaborative workspaces are optimised for telework by freelancers, entrepreneurs, and public and private sector employees, aiming to be vibrant urban work clusters equipped with the latest information and telecommunication technologies, together with traditional office facilities such as meeting rooms, event space, kitchens and cafes. Digital working hubs have the potential to become booming in regional areas, thereby improving the regional capability of businesses, and promoting creative and flexible business, work–life balance, and community engagement, as well as reducing the congestion in city centres and alleviating pressure on infrastructure (Vallicelli, 2018). Recently the Queensland Government is promoting a digital working hub project across south-east Queensland.

4.1.5. Office clubs

Office clubs utilise non-exclusive office space, located mainly in suburban areas, tailored to suit the demographics of the company's employees/clients. The office club allows business associates to work together, and the office space is shared by collaborating organisations. These office spaces are typically situated close to transport links, shops, restaurants and car parking. Office clubs reduce the risk of companies needing to hold large real estate assets in such central CBD areas.

4.2. Recent studies on FWM

In recent years the emergence of FWM has drawn the attentions of scholars. Table 2 of this paper summaries recent studies on FWM over the past decade from 2007 to 2018. In recent years there is an increasing focus on FWM, leading to more attention from the research community. From the table, we can see that the majority of research has focused on teleworking and coworking, which are considered as the two most mature FWMs. Research methods applied included questionnaire, interview, observation, literature review, etc. The topic of studies exhibit a broad range, from the effect of FWM on traffic, to how coworking users improve entrepreneurial situations, to assessing factors accounting for coworking's rapid growth.

5. Discussion – Impact of flexible working model

The emergence of FWM has a significant impact on not only individual workers, but also the urban environment, economy and planning. Past research suggests that FWM potentially can reduce traffic congestion, due to the flexible work locations and working hours (Ge et al., 2018; Mokhtarian et al., 1992). Therefore, it is important for transport planning and relevant urban infrastructure planning to support and accommodate a continued rapid growth of FWM. Furthermore, studies from various perspectives show that FWM tends to promote business collaboration (Spinuzzi, 2012), creativity/innovation (Stumpf, 2013), and enhance employees' satisfaction (Bentley et al., 2016). Fig. 2 illustrates the impact of FWM on urban environment, economy, and planning.

5.1. Impact of FWM on environment – Pollution reduction

Yang (2013) stated that systematic and comprehensive countermeasures in urban planning guidelines should be established to achieve low-carbon green growth in terms of urban structure and land use, transportation systems, natural resource conservation, environment management, energy and open spaces. FWM enables employees to work in a different location, such as coworking space, a café, work hub, or by working from home (telework), which can potentially change energy use patterns both at home and associated with travel/transportation (Schipper, Bartlett, Hawk, & Vine, 1989). Mokhtarian et al. (1992) studied emissions resulting from a telecommuting project in California in the early 1990s, and the results suggest that travel can be significantly reduced by adopting telecommuting.

Ge et al. (2018) studied various workplace sharing programmes to explore how workplace sharing is affected by agent interactions within the transport network. A spatial agent-based model of transport was applied with the employees working remotely in Northeast Scotland. The results show that adoption of workplace sharing by large organisations can provide tangible benefits to reduce congestion and pollution from transport, particularly for commuting times and CO₂ emissions. Meanwhile, Zhang, Yang, Huang, and Zhang (2005) suggested that adopting telework can significantly reduce congestion, especially in peak hours. It appears that daily commutes to and from work can be considered one of main reasons that cause urban traffic congestion. Besides

Table 2
Studies of FWM from 2007 to 2018.

Year	Author	Location	Working model	Research method	Research Aim
2007	Gajendran and Harrison (2007)	USA	Telework	Systematic quantitative literature review (46 studies)	Exploring the positive and negative consequences of telecommuting.
2010	Hill, Erickson, Holmes, and Ferris (2010)	4 group of 75 countries	Telework	The 2007 IBM Global Work and Life Issues Survey (A random sample of IBM employees)	Exploring the influence of workplace flexibility on work-life conflict for a global sample of workers from four groups of countries
2010	Kelliher and Anderson (2010)	UK	Telework and non-flexible workplace	Focus groups interviews and questionnaire (37 participants)	Investigating the lived experiences of flexible workers in particular how the flexible working impact on their working lives.
2012	Spinuzzi (2012)	Austin	Coworking	Fourth generation activity theory	Exploring how coworking is defined by users and proprietors. And how professionals collaboratively construct coworking.
2012	Kleijn, Appel-Meulenbroek, Kemperman, and Hendriks (2012)	Belgium and the Netherlands	Activity based workplace	Observations	Exploring the factors that influence the activities at workplaces in an activity based office environment
2012	Harker Martin and MacDonnell (2012)	Canada	Telework	Systematic quantitative literature review (22 studies)	Integrating multidisciplinary literature that reports effects of telework on organizational outcomes.
2014	Coenen and Kok (2014)	Netherlands	Telework	Face-to-face interviews and documents (7 members)	Investigating the effects of telework and flexible work schedules on the performance of teams
2015	Rus and Orel (2015)	Europe	Coworking	Literature review	Investigating the factors for the rapid growth of coworking.
2015	Fuzy (2015)	UK	Coworking	Combined qualitative and quantitative method, 46 questionnaires.	An empirical evidence based exploration of whether coworking spaces can promote entrepreneurship in regions with sparse entrepreneurial environments.
2015	Ross and Rescia (2015)	Australia	Coworking	Interview (22 owners and managers, and 19 coworking space users)	Analysis of the factors that are driving the increasing use of coworking space.
2016	Bentley et al. (2016)	New Zealand	Telework	On-line questionnaire survey (804 teleworkers within 28 organisations)	Examining the role of organizational social support for teleworkers in terms of their wellbeing
2017	Jakonen et al. (2017)	Two European countries & USA	Open coworking spaces and a corporate coworking office	Interviews and observations of both social and material interactions (59 participants).	Examining the nature of encounters in coworking through the concept of "economy of encounters".
2017	Brown (2017)	UK	Coworking space	Q-methodology, which integrates qualitative and quantitative techniques to reveal social perspectives. In this study, the method is applied to investigate the shared attitudes and viewpoints of 19 coworkers.	Exploring the motivations for coworking and benefits of co-location.
2017	Garrett et al. (2017)	U.S.A	Coworking space	Ethnographic observations, semi-structured interviews, and email conversations posted on a private member email list (34 regular members + 29 affiliate members + 15–25 people in the space on a typical weekday)	How members of a coworking space work together to co-construct a sense of community through their day-to-day interactions in the space
2018	Bouncken and Reuschl (2018)	Global	Coworking	Literature review	Exploring how coworking users improve their entrepreneurial or economic situation. Build a first conceptual model with key mechanisms of coworking-spaces.
2018	Göçer et al. (2018)	Turkey	A flexible office	i. Occupancy tracking and instant surveying through barcode scanning (25 participants). ii. Questionnaire (394 participants), Participant observation, Semi-structured, interviews, walkthroughs and meetings A postal questionnaire survey (900 participants) and an online survey (300 participants)	Examining the directives in workplace choice and mobility in the flexible office.
2018	Ge et al. (2018)	Scotland	Workplace sharing		Exploring effect of the various "unconventional" workplace sharing programme on reducing congestion, pollution and travel time.

teleworking, coworking is stated as a potential strategy to reduce the number workers who must commute to urban CBDs to work (Ross & Ressia, 2015). Therefore promoting suburb based coworking centres can possibly be beneficial for the environment by reducing the traffic associated with coworking space users.

5.2. Impact of FWM on the economy – Promoting business collaboration/innovation, cost savings, and boosting employee satisfaction

FWMs such as coworking spaces are considered to improve the exchange of knowledge among members, and foster more collaborative practices that can drive innovation (Capdevila, 2013; Jakonen et al., 2017), cost savings, as well as increasing employees' satisfaction (Kelliher & Anderson, 2010).

- FWM promotes business collaboration/innovation

Enabling knowledge sharing, cross-functional cooperation and inter-organisational involvement are some of the benefits of adopting flexible workplaces. Spinuzzi (2012) suggested that the social interaction at coworking centres between coworkers provides further opportunities for collaboration and innovation, compared to working either from home or from a traditional office environment. Stumpf (2013) suggested that a subsequent 'cross pollination' of ideas occurs among groups of coworking members which potentially enhances innovation, creativity and entrepreneurship. Garrett et al. (2017) explored the sense of community in coworking spaces by analysing coworking members through their day-to-day interactions; they identified three different types of collective interactions which contribute to a sense of community, namely endorsing, encountering, and engaging. Kleijn et al. (2012) found that there are complex relations between environmental characteristics, workplace functionality and activity; and also found that there is a close link between workers' selection of job activities and the functional characteristics of workplace. That means interactions between members could potentially bring better business collaborations among like-minded companies.

- Cost savings through FWM

Particularly for small companies, FWM approaches such as teleworking or coworking will significantly reduce the cost of expensive office space rental, office energy consumption, etc. Voordt (2003) studied potential costs and benefits for flexible workplaces, stating that cost reductions were not only related to direct costs such as space savings, but also indirect benefits from employees working more efficiently, plus saving on employees' commute times.

- FWM boosting employee satisfaction

Morrison and Macky (2017) suggested that flexible and/or shared workplaces are associated with greater employee satisfaction, and improved flexibility in the use of the physical space. Similarly, Kelliher and Anderson (2010) also found that people working in flexible workplaces have a higher level of job satisfaction, with a higher organisational commitment than others working in a nonflexible environment. Their study shows that employees respond to the ability to work flexibly by exerting additional effort, in order to return benefit to their employer. For teleworkers, Bentley et al. (2016) stated that organisational social support and teleworker support was associated with increased job satisfaction and reduced psychological stress. Coenen and Kok (2014) suggested a positive effect of telework on workers performance and satisfaction. Göçer et al. (2018) applied a post-occupancy evaluation (POE) approach to study work-related consequences. Their results also suggest that 'mobile employees' satisfaction is higher than for 'fixed flexible' employees.

The negative impacts of FWM in terms of employees' satisfaction have also been investigated. For instance, Morrison and Macky (2017) suggested that when adopting shared work environments, there were no improvements to co-worker friendships, and at the same time employees' perceptions of supervisory support decreased.

5.3. Impact of FWM on urban planning – Changes to transport and urban structure planning

Many major cities around the world including Australian cities are facing the problem of traffic congestion. The avoidable costs of congestion in all major Australian cities in 2005 was \$9.4 billion, as estimated by the Australian Bureau of Transport and Regional Economics (BTRE). BTRE have noted that this number would likely increase to \$20.4 billion by 2020 (BTRE, 2007). A flexible workplace arrangement could contribute to reducing congestion through voluntary travel behaviour changes. Flexible work strategies can incorporate different forms of workplace options into a comprehensive workplace approach, for achieving transport outcomes such as peak commuter spreading (Cleary, Worthington-Eyre, & Marinelli, 2010; Marinelli, Cleary, Worthington-Eyre, & Doonan, 2010). For example, the 'Flex in the City' project that was established in the city of Houston, USA in 2006 sought to test the effectiveness of a flexible workplace strategy in helping manage and reduce freeway congestion; the results of that project indicate that adopting greater workplace flexibility could save 906 peak-commute hours on the targeted freeways, translating to an annual user cost savings of \$16.8 million (City of Houston, 2010). In Australia, the Queensland Department of Transport and Main Roads (DTMR) undertook the Flexible Workplace Program Brisbane Central Pilot in 2009 across 20 public and private sector agencies. The aim of that Australian project was to test the applicability of a voluntary travel behaviour change program for achieving transport system outcomes, particularly as related to managing congestion, either through mode shift or peak spreading (Nielsen, 2009). That program proved the benefits and the need for adopting more holistic workplace approaches for transport outcomes. Some flexible



Fig. 2. Impact of flexible workplace.

working models such as digital working hubs aim at heavy adoption within regional areas, thereby improving the regional capability of businesses, work–life balance, and community engagement, as well as reducing the congestion in city centres and alleviating pressure on infrastructure (Vallicelli, 2018). Petch (2015) investigated the role of coworking in city planning, by observing and interviewing coworking space users in Toronto, Canada; he proposed that sustainability is achievable via the “sharing nature” of coworking. The sharing of workplaces leads to less traffic costs and also encourages a “collaborative lifestyle” that generally encourages people to share facilities. By allocating more workers to regional areas, there are also potential associated changes needed to urban infrastructure planning.

5.4. The implications of FWM's environmental, economic and urban planning impacts on urban management

As discussed above, from various perspectives FWM has a significant impact on environment, economy and urban planning. FWM's increasingly fast transformations and growing impacts to those three areas, are worth consideration during creation of urban management policies. From the above review, we can also see that there is an increasing number of FWM related studies, and the research community has become increasingly aware of it. There are important implications for urban management. Firstly, allocating flexible workplaces into regional areas will be beneficial for reducing pollution (Ge et al., 2018), reduction of traffic congestion, and also increasing workers' productivity (Coenen & Kok, 2014). Secondly, due to the increasing number of flexible workplaces, it is desirable to accommodate the flexible working trend with appropriate associated transport and urban planning. Thirdly, promotion of FWM will potentially bring business benefits, such as increased innovation, and enhanced productivity for organisations' employees, and as a result will indirectly benefit the economy. Fourthly, increased adoption of FWM's flexible working hours, will also directly benefit employees' wellbeing and work-life balance, and also lead to increased business hours usage of urban facilities (Petch, 2015) thereby stimulating both the economy and facilitating more healthy lifestyles. Going forward it will be beneficial for policy makers to consider strategies for promoting FWM.

6. Conclusion

This paper explores the impact of future FWM on urban environment, economy and planning. The history evolution of FWM, various types of FWMs, and relevant recent research has been discussed and investigated. Multiple impacts of FWM adoption have been detailed: Adopting FWM can effectively reduce pollution via decreasing traffic congestion, and also reducing commute times. FWM potentially boosts business collaboration and promotes innovation through enhanced social interaction at shared workplaces (Spinuzzi, 2012). Adopting FWM can also save costs of office rental, office energy consumption, as well as the enhancing employee work productivity (Voordt, 2003); FWM can also boost workers' job satisfaction (Kelliher & Anderson, 2010), and lead to potential changes for transport and urban infrastructure planning (Vallicelli, 2018).

With the development of smart cities, and the emerging of sharing culture, the reach of FWM is spreading at rapid speed. It is anticipated that the future of FWM will focus on both operating models and workplace design. Innovative solutions in designing and planning for workplaces are being presented to further increase flexibility with ever more efficient uses of space, time and money, which can lead to both higher productivity and satisfaction (Göçer et al., 2018). Understanding how to optimally utilise new workplaces, modelling user behaviour, and identifying the key variables affecting the utilisation and effectiveness of flexible working spaces, will be important topics of future research focus (Kleijn et al., 2012; Van Meel & Vos, 2001).

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