Re-shaping the construction industry

A cura di

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"The maintenance paradox"

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Abstract

This research will spot main features of servitization in real estate, placing main emphasis to current and future development of the trend. In manufacturing the servitization process has already been studied since the late 1980's, whereas in real estate is a phenomenon not been clearly defined yet. Despite being a market characterised by low speed innovation, currently some changings in management of the built environment can be noticed: with new business models and financing structures, a shifting from a product-oriented market to a service-oriented one can be spotted. Therefore, through this research will be investigated the servitization process, with regard to maintenance management, no longer conceived as an optional non-core activity, after the transaction of the asset, but as part of the services included in the purchasing of the building and its facilities. Accordingly, the building is conceived more and more as a complex tangible and intangible entity, not only characterised by its production and location value, but also by its capability to offer a wide array of services to users. Thus, after a phase featured by the willingness to acquire legitimacy in the building process by the maintenance operators, we are witnessing to the maintenance paradox: the servitization of business model in real estate, leading to performing "the maintenance without maintenance". The paper concludes with some considerations on future development of the research and trends in the real estate market.

1. Introduction

In the contemporary historical period, we are assisting to a shifting of the attention, form the traditional meaning given to the building, conceived as tangible good exploited as mean for the achievement of a primary objective, to the integration physical assets in services delivered to the client, asking for a high quality work environment. This way of thinking about the real estate, brings tangible and intangible goods and services as a whole. In manufacturing, the trend is generally defined as servitization (Luoto *et al.*, 2017), intended as a strategy for improvement companies' competitiveness through the inclusion in the selling of a product an array of related services to the client, to be activated also after the transaction phase (Vandermerwe *et al.*, 1988). Glancing at the real estate, this is a trend spreading especially in corporate world, where the demand for efficient and integrated spaces is more and more a key enabler for success and competitiveness.

The shifting of attention is triggered by many factors featuring the contemporary economy and society, characterised by the advent the digital environment: the virtual and augmented space of work and life. In Architecture Engineering Construction and Operations (AECO), this trend is enhanced through the more and more frequent use of Information Technology (IT) tools, shaping the figure of the architect and of the engineer of the future. We are not only referring to the Building Information Modelling (BIM), which allows a more precise and complex representation of physical and semantic information of buildings, furthering interoperability and collaboration among professionals during the whole life cycle of asset (Eastman *et al.*, 2011; Mignard *et al.*, 2014; Pärn *et al.*, 2017). Since management of building and its surroundings is nowadays intrinsically connected with sensors, remote controlling and, more in general, huge data flows; we are taking into consideration the complex ecosystem of information, physical shapes and semantics, characterising the every-day life and work in AECO. The built environment could, in this sense, is featured by a real time heterogeneous flow of data that must be interpreted and managed through brand new tools and approaches. Accordingly, IT tool must be exploited to catch the new complexity and manage cross-sector problems.

Regarding AECO and in particular Operations Maintenance and Repair (OM&R) branch, the old paradigm, characterised by the assumption of reduction building-related costs, to achieve a higher performance level (Ottoman *et al.*, 1999; Ho *et al.*, 2000), should be revised to achieve the definition of a novel approach conceiving the building and the related services as a whole. Therefore, it could worthwhile to consider facility, property or asset management no longer as functions devoted to the optimisation of the non-core business of a company to be more effective in achieving its goals, but as a part of the core business itself. In this sense, OM&R management (part of the typical facility management operations to accomplish) will becomes a structural part of the main objective of the company (fig. 1).
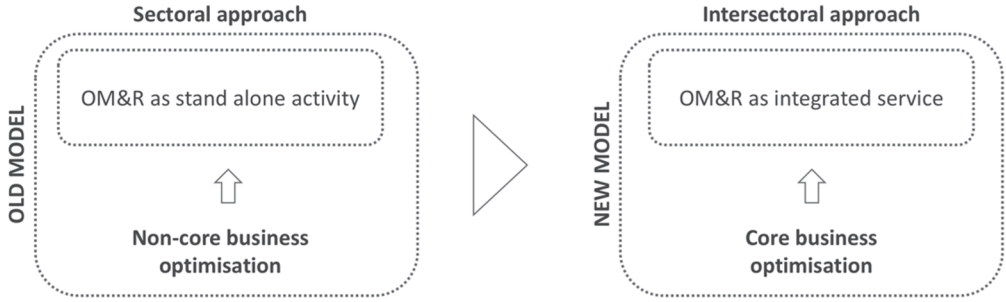
Fig. 1: Shifting from the old to the new model in OM&R

The paper concludes with some insights concerning the development of brand new and integrated approaches in real estate and with a look at the next development of the research.

2. Servitization in real estate

Servitization can be defined as a strategical change of companies' behavioural attitude, concerning the shifting from the traditional approach concerning the selling of products to the combination of products and services to be considered as complementary (Vandermerwe *et al.*, 1988; Mathieu, 2001). This is due, in the manufacturing market, to the advent of rivals introducing low-cost products, leading to a disequilibrium (Luoto *et al.*, 2017). In Table 1 are reported some definitions of servitization, taken from Baines *et al.* (2008).

Table 1: *Definitions of servitization taken from* (Baines *et al.*, 2008).

Author	Definition of servitization
Vandermerwe *et al.*, (1988)	Market packages or 'bundles' of customer-focussed combinations of goods, services, support, self-service and knowledge.
Desmet *et al.*, (2003)	A trend in which manufacturing firms adopt more and more service components in their offerings.
Tellus Institute, (1999)	The emergence of product-based services which blur the distinction between manufacturing and traditional service sector activities.
Verstrepen *et al.* (1999)	Adding extra service components to core products.
Robinson *et al.* (2002)	An integrated bundle of both goods and services.
Lewis *et al.* (2004)	Any strategy that seeks to change the way in which a product functionality is delivered to its markets.
Ward *et al.* (2005)	Increasing the range of services offered by a manufacturer
Ren *et al.*, (2007)	A change process wherein manufacturing companies embrace service orientation and/or develop more and better

services, with the aim to satisfy customer's needs, achieve competitive advantages and enhance firm performance.

Accordingly, the manufacturer is no longer attractive selling simple products, therefore a new service-oriented trend in business model emerged. Servitization plays a key role in term of competitiveness in the current manufacturing market condition characterised by a high speed changing environment. Advantages coming from the adoption of this new strategy can be summarised according to strategic, marketing and financial benefits (Mathieu, 2001).

Concerning the strategic benefits, it can be stated that shaping the business according to an array of services to deliver to the client, the firm is more competitive its sector and is pushed so setup long term objectives, improving strategic and management decisions (Martinez *et al.*, 2010). Concerning the marketing advantages, it is likely that the client will perceive the specific product and set of services delivered by that specific company as a sort of trademark, thus the company will be unique and more recognisable in the market. Eventually, in terms of financial advantage, selling integrated products and services will increase company's income (Zighan *et al.*, 2015).

Despite since the late 1980s servitization seems a topic explored in many disciplinary fields (Vandermerwe *et al.*, 1988) as instance, service management, strategy, operation management and marketing; few researches attempt to address the issue of servitization in real estate. Nevertheless, the trend can be highlighted as a general tendency for the overall real estate market, since it is characterised by a low speed innovation, despite deep changings can be spotted in the last years, because of the massive introduction in building process of IT tools. Therefore, studies on servitization are not spread in real estate as in other sectors.

The servitization in real estate is both furthered and pushed by the need for tools used to manage the complexity of the new real estate digital environment, triggering a circular process. Therefore, if on one hand, the complexity of the building process is increasing; on the other hand, this complexity is partially due to the advent of new technologies allowing a contamination in disciplinary fields and requiring new shaped professionals.

In the next paragraphs will be explained how new needs and the adoption of new tools in real estate are conditioned mutually and trigger an overall paradigm shift in AECO

3. New needs

To be more clarify the above mentioned concepts, a clear example describing how RE is changing can be found in the design and management process employed by a huge US company managing workplaces of different kind of nature. This company, called WeWork, provides workspaces for freelance, start-ups and small firms which require a location where to set their premise. WeWork not only designs and develops office and workplaces, both for business asking for a private office and for co-working facility, but also provides a set of services to enhance business. These services are, for instance,

bank and financing, HR, storage solutions, accounting and logistics services[1]. It can be stated that WeWork creates both physical and virtual places and allows to include them in a wider virtual community. Therefore, the client can purchase a package of services, paid monthly, which gives him the access to a more or less complex physical and virtual space. It is clear that the mission of the company is highly client oriented since, after the moving of the business in the new premises, feedbacks and suggestion on the comfort, dimension and adequacy of space, furniture and services are collected through a mobile app (Davis, 2016). WeWork operates in sixteen countries worldwide since 2010, thus a great amount of data has been collected. One of the very innovative thing concerns the way these data has been exploited in improving the service provided to the clients. In particular, an innovative design methodology for meeting rooms has been developed by the company. The methodology employ Artificial Neural Network (ANN), a type of machine learning, having as input the dimension of the meeting room and differences in the layout. The network has been trained to make a prediction on the rooms' utilisation according to the occupancy of the office and the number of hosted companies' employees. These results are used to improve design quality and comfort of spaces. Moreover, through this illustrated example, it had been demonstrated that the precision in the prediction made by the ANN is 40% more accurate than the one made by designers (Phelan, 2016). In Fig. 1 are represented the results of the analysis
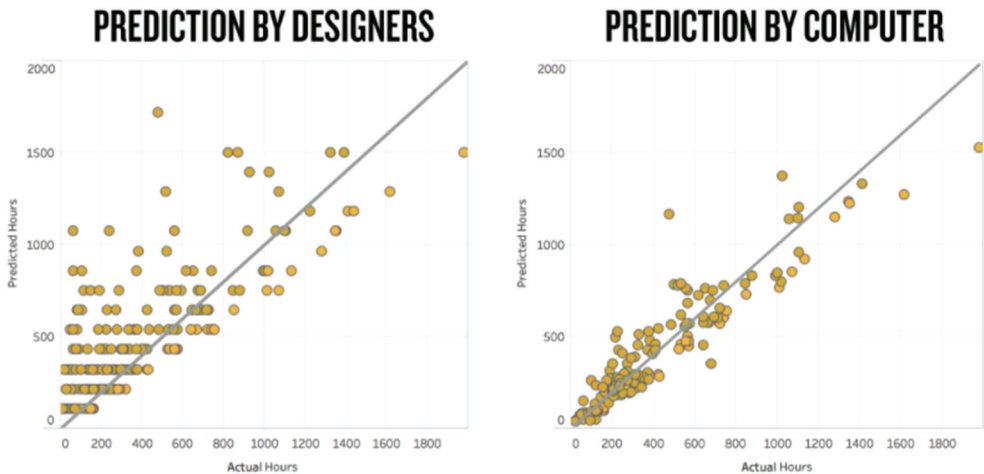

Fig. 1: Actual number of hours a meeting room was occupied with the hours predicted by designers (left), and by the neural network algorithm (right) (Phelan, 2016).

Of course, this is just an example of how RE is changing in a more integrated and interconnected physical and virtual world, but it is pretty representative of the trend described in the previous paragraphs. In the next paragraph will briefly presented how available tools can affect the building process, furthering the servitization paradigm in real estate.

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[1] More information at: www.wework.com.

4. New tools

As said before, the servitization can be encompassed in a wider context of redefinition of the typical AECO sector: the paradigm shift. Moreover, the new needs can be pushed, involving IT, data science and, in general, the advent of the digital built environment. In this framework can be placed and briefly discussed some emerging topics, which will be very soon wide acknowledged in RE and AECO industry, despite some forefront application can be found in the market.

Buildings are producing and receiving a very huge amount of information every day, because of the more and more wide presence of highly technological components in it. These components, tied to a system of sensors and actuators, allow the control of systems and plants in the building via remote controlling, usually shaped in the form of a mobile application. These information exchange between the user and the building is typical of the "cognitive building", namely asset which adapts according to the behaviour of the users that, conversely, receive information from the asset and can be involved in the control loop in a bi-directional way (Rinaldi *et al.*, 2016). These data, can be considered as big-data in RE, since they respect the typical characteristics featuring this kind of information. If we take into account a sensor system, for instance, data are produced daily, hourly or even in a shorter time span, accordingly they are characterised by velocity and volume. Moreover, data sources can be very differentiated: from data produced by sensors, to feedback provided by users (as mentioned in paragraph 3); geometric information provided by designers and, in general, technical managers during the use phase of the buildings; semantic information regarding materials, durability maintenance and technical characteristics of products and spatial data, when we are considering the whole built environment. There is no question that these variety of data, combine with characteristics cited above, leads to veracity of data, defined as the combination of characteristics of volume, velocity and variety (Manyika *et al.*, 2011). Therefore, it is worthwhile to consider in the very next future a strong integration of AECO with IT and, in particular, with big-data analysts, able to give an interpretation to this new complexity and to push more and more complex datasets exploited to achieve a holistic management of the built environment. Altogether, stepping into of a new era in real estate through the paradigm shift triggered by serivtization, the building should be to conceive no longer as an entity characterised only by its intrinsic position and economic value, but as part of a more complex service to be provided to the end user and to the client: the target of an integrated and complex design and management of the digitalised built environment. At this stage a new issue emerges, concerning how to measure the performances of the new entity building-service and how to exploit these measurements to achieve a sustainable built environment. Performances could no more be categorised through the typical classification based on issues related to physical, functional, financial characteristics of the building (Lavy *et al.*, 2014), but must be considers in a brand new complex way. To tackle this issue, it seems worthwhile to consider the building itself as part of the core business of the given company. If traditionally, the tangible goods have been considered as part of the non-core business, namely as side issue to be optimised in order to dedicate

the most part of the resources to the core-business activities; now the attention must be shifted in a cross-over field. Taking into consideration servitization, a new kind of cross-domain metrics are needed, able to catch and measure the process leading to the achievement of a given core-business goal, comprehending the optimisation what is typically conceived as non-core performance, now intrinsically included in the core activities of companies.

Altogether, the complexity, should find a place where to take form, allowing to be managed by the new engineers. A possible view is already available and can be declined in the new approach: the Asset Information Model (AIM) introduced by the BS-PAS 1192-3:2014, and defined as the virtual environment enabling the management of the complexity of the new real estate paradigm.

5. Discussion and conclusions

Needless to say that the paradigm shift brings the need for developments of new procedures, measurement tools and involvement of diversified stakeholders. Regarding the procedural framework, we can refer to the abovementioned BIM approach, reaching in the last year a more and more comprehensive level of management of information (Pärn *et al.*, 2017). Concerning measurement tools, the needs is shifting toward the development of cross-domain KPIs, enabling the optimisation of what is typically intended as non-core performances, according to a given core performance benchmark. In terms of stakeholders, boundaries of OM&R discipline should open and include new issues in a primary standing position. This is the case of the users: the final client asking for a comfortable and high performing space and at the same time, the first source of data, thanks to the close interaction with the built environment and its components (Rinaldi *et al.*, 2016).

In this context, servitization allow to explain how the real estate is undergoing a strong paradigm shift, more and more integrating physical essence of the building with the services delivered through its use. Concerning OM&R services the trend is evident. In past decades, maintenance has typically been conceived as a side activity to be accomplished, after the handover of the building. In the current period, on the contrary, we are assisting to the integration of the OM&S management as one of the services to be delivered to the client jointly with the physical assets. Accordingly, we are assisting to a paradox: virtually the maintenance is performed without maintenance, since it is part of real estate services.

In this research the issue is addressed to OM&R services. nevertheless, as described in paragraphs above, the same servitization process could applied to the wide array of services concerning the built environement, not only at the building scale but also at the level of the urban precincts.

To conclude, this research could be considered as the first step in the definition of the paradigm shift in the real estate sector, therefore a lot of work is still to be done. Nevertheless, the boundaries of servitization in OM&R, through this work could be clearer, though the discussion is still open and need to be refined.

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