Mobility for ‘Immovables’ – Clouds Supporting the Business with Real Estates

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Abstract

Businesses operating with ‘Immovables’ have always demanded high mobility from numerous protagonists within and across the real estate sector. Whereas recent developments of advanced cloud environments such as pervasive cloud and intercloud infrastructures are still in their infancy, their advancements appear to be supportive for this industry. Our contribution refers to the business with real estates as this sector shows several characteristics that predestine it as a showcase due to high and sustainable potential for value generation through clouds and cloud infrastructures. This paper analyses the use of various (types of) cloud applications in the field of real estate. It provides an insight into the structure of the real estate sector (life cycle, value chain, actors), into the state-of-the art of cloud applications, and reveals potential for further developments and unexplored segments of the real estate life cycle and/or value chain.

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1. Introduction

The multiplication of mobile devices has fostered new technological applications such as pervasive clouds¹ and intercloud computing.² The former increases the connectivity of various entities and the latter aims to establish an interconnection between heterogeneous clouds and cloud architectures. In this respect, cloud computing has developed

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into an appealing alternative of utilizing and providing IT services. However, the integration of private, public and hybrid clouds (i.e., a combination of private and public clouds) supports enterprises to enhance the scalability of their IT-resources, making them quantifiable, and allows for short-term adjustments when fluctuations in capacity demand occur. Furthermore, it supports customers to increase, enhance and harmonize IT-features from a wide range of service-providers for various actors within a sector.

Recent literature mentions cloud computing in context of large supply chains or networked supply chains; an example from the textile industry using technologies like internet of things is provided by Mladenow et al. Hence, pervasive systems and interconnectivity of cloud providers are desirable features by increasing the availability of cloud solutions for the entire set of actors within and across industry sectors such as real estates.

The issue of mobility is an important factor for these actors. Against this background, this paper presents and examines how and where cloud computing may contribute and generate value in the real estate value chain. The rationale behind the choice of this sector is driven by the benefit itself and its sustainability that clouds may generate. The rationale is based on three factors, i.e. (i) the business objects in real estate have high values, (ii) the entire life cycle of real estates spans a long period of time, and (iii) a heterogeneous set of actors and stakeholders is involved alongside the value chain, many of them are sole trader businesses or small and medium-sized enterprises. The impacts may be intensified, as real estate is a business sector “where technology seems to have been almost passed over”.

The presented study analyses the potential and the impact of today’s cloud computing in the real estate sector by locating and spotting their potential value and effects, and mapping them onto the life cycle and/or value chain of real estates. In the next section we give an insight into the real estate sector by focussing on three relevant dimensions, i.e., life cycle, value chain and actors. Furthermore, involved actors and distinct core issues are discussed, focussing on the life cycle concept and a supply chain layout of real estates. Section 3 analysis selected cloud solutions (products and services from the DACH-region). Finally, a discussion presents advantages of cloud applications versus in-house solutions, summarizes the key findings regarding current cloud applications in the real estate sector and provides a brief outlook on further developments.

2. Life cycle, value chain and stakeholders in the real estate sector

This section provides an insight into the real estate sector and its structure. After a synoptical description of the field, we show generic versions of a life cycle and a value chain, and list possible stakeholders.
As can be observed in Figure 1, where focus is laid on four major dimensions, i.e. management, institutions, typology, and interdisciplinarity, real estate economics has a wide range of categories, subcategories, interrelations and diversification (cf. Figure 1). This table shall give a snapshot of the placement and the scientific reference point of the real estate topic, together with selected categorizations and systematic views.

The following overview on the real estate’s life cycle together with the sequence of its phases forms the basis to generate a notion of the potentials of clouds and interclouds in that sector. For the purpose of gaining insight into various ideal-typical phases and their characteristics in the life cycle of the real estate sector we analysed several approaches.13,16,17,18,19

We combined a refined version of the life cycle approach from Hellerforth17 with the approach of Isenhöfer and Väth18,19. They distinguish four main phases, i.e. development, utilization, vacancy, and redevelopment. Integrating additional information on rough-cut and exemplary durations of the sub-phases (based on Preuss and Schöne16) which in turn allows for making a rough estimate of a possible timeline. Major disparities in duration provide a strong indicator for prioritisation in process improvement and decision support for sustainable infrastructure like clouds. The potential of clouds is not limited to the application of internal processes but is to be applied to the value chain as a whole. Figure 2 provides an overview on the real estate’s life cycle and the sequence of its phases together with a rough and implicit timeline.

In real-world cases the described life cycle phases do not necessarily appear strictly sequential, but will more likely incorporate one or several loops and overlapping phases concerning time and content (e.g., a redevelopment phase will lead to another phase of utilization, or in a housing complex vacancies will appear due to contract expiries of rented units).

In general, four major phases can be distinguished which we briefly describe in the following, together with exemplary factors and with activities performed within those phases. These activities may vary depending on the type of usage (personal, third party) and purpose (commercial or residential): (i) development phase: search, analysis and choice of location/site, acquisition, constructability, property development, approval procedures, clearances, project initiation, formation of consortium, controlling, budgeting, monitoring, commissioning, etc.; (ii) utilization phase: maintenance and repair, refurbishment, facility management in terms of technical, economic and infrastructural aspects, property management, safety, adaptations according to legislation and/or user requirements, rectification of defects, value monitoring, etc. (iii) vacancy: changes in infrastructure and/or market conditions as well as a lack of maintenance may lead to (undesired) partial or entire vacancy, commissioning, etc., and (iv) redevelopment: evaluation of external/internal factors (e.g. market forces), change in use, change in requirements, adaptation, conceptualization under given constraints (e.g. legal regulations for the protection of cultural heritage), removal, etc.
Value chains are closely related to life cycles; the structure of the real estate’s value chain as well as the roles and actors performing value creation and/or adding value to real estates can be derived from the real estates’ life cycle. The actors who execute value adding activities are real estate brokers, agents, investors, banks, consultant engineers, civil engineers, construction firms, appraisers, consultants, lawyers, solicitors, marketers, customers, renters, financial experts, advertising/PR specialists, property/building/project developers, facility managers, etc. Their interaction patterns aim at value creation along the entire real estate value chain and include activities such as planning, construction, selling and letting, funding, administration, and maintenance. Figure 3 gives an insight into the real estate value chain and exemplary value creating activities.

![Real estate value chain and value creating activities](image)

Until now, in the real estate business sector-specific applications are used on an intra-company basis in real world settings, i.e. computerized maintenance management system (CMMS) also called computerized maintenance management information system (CMMIS), computer aided facility management (CAFM), and portfolio management software.

### 3. Mobile and flexible cloud solutions in the real estate business

#### 3.1. Cloud requirements from the real estates’ business

Recent publications in cloud computing mention a paradigm shift in IT industry: clouds are enablers for a shift towards highly specialized data centers which offer their services in return for a certain fee. The major advantage of cloud solutions is their flexibility: as cloud usage may be quickly adjusted to fluctuating demand in resources, users are in control over both performance and costs.

The real estate industry is a very suitable example of application for clouds as the issue of mobility is highly important in each life cycle phase. However, it should be pointed out that in the real estate industry the issue of mobility was always a necessity (even before recent technological innovations). Many tasks need to be performed on site, e.g. inspections and maintenance operations are to be carried out on site (i.e. the geographical place of the real estate). In this context some supporting tools have been in use e.g. in order to document claims and to hire a third-party contractor to do repair works. Such solutions can be implemented in combination with other tools available in the market and run in a private cloud. Due to improved functionalities and better online infrastructure for mobile
devices the performance, execution, assignment, monitoring, and documentation of tasks that are to be performed on site, can be improved; the efficiency of processes is another key indicator that can be enhanced.

Tools such as e-rooms and project servers are meant to share documents and information. They are used in order to facilitate ongoing communication between project group members including lawyers, architects, consultants, planners, developers and other stakeholders. Cloud computing is able to contribute in such context. Resources can be bought and turned off again when not needed, users can be added or removed. This is the operating mode how project servers are actively used for specific projects.

Cloud technologies may be integrated into existing systems via APIs (application programming interfaces), due to the way they are programmed. When properly applied, cloud technologies lead to an improvement of processes and support communication between all players in the supply chain. In many cases, various systems can be reduced to one single application providing a central access point for different departments, which represents a reduction in systems’ complexity. Particularly in large corporations with numerous workflows and processes, an integrative solution including automatic evaluations enhances efficiency. Virtual desktops and the use of mobile devices allow employees to access the company’s network from remote on-site locations and enables them to access in-house information and to keep colleagues up to date.

One of the most important advantages of web-based platforms is their independence from operating systems and compatibility with almost every properly programmed browser. Through the elimination of hardware costs, especially small and medium-sized enterprises may benefit as capital lockup can be reduced substantially. Issues regarding privacy and data security are frequently raised, because especially in large companies very strict compliance rules and guidelines are applied and monitored e.g. by the workers’ council, by internal audits or other supervising departments.

In the following we will outline several best practice examples of implemented cloud solutions for the real estates sector. We thereby focus on products of the German-speaking part in the DACH region (i.e., Germany, Austria, and Switzerland, whereas D, A, and CH are country codes).

3.2. Functionality and range of application for selected cloud solutions

In the following subsection we describe the functionality and applicability of exemplary cloud products to provide an insight into state-of-the-art cloud solutions on the German-speaking market for real estates’ applications. Cloudpilots.com is a German vendor and cloud solutions provider specialized on mobile cloud-based applications for the construction business. They offer an integrated Cloud-Suite with Google Apps, where the entire range of functions is bundled in a single platform. Several of their cloud solutions are appropriate applications for maintenance and facility management with emphasis on technical and infrastructural aspects. Videoconferencing features designed for groups of involved people (e.g. experts, consultants, civil engineers, operational staff) allow for a quick remote overview of on-site situations and conditions, at the same time documentation is performed via the cloud-based file sharing-system. This may be important for reasons of liability, claims, and/or insurance matters. One module of this product supports mobile recording of working time via GPS localization (e.g. when employees perform tasks at remote sites/buildings), another one supports planning processes during development phases (conceptualization, planning, and realization). This module uses Google sites and allows for uploads, downloads, editing and communication on building and construction plans, applications, submissions, approvals and clearances, tenders and bids. A further module supports ad-hoc requests, coordination and assignment of workers and/or experts with certain qualifications and/or skills, machinery and/or materials.

Another showcase example for a cloud solution is the software TeamProQ.de, which supports the entire life cycle and its involved activities along the value chain of real estates. It can be classified as an all-rounder tool for SME’s in the real estate business; emphasis is laid on communication, cooperation and teamwork. TeamProQ.de is promoted as a SaaS (Software as a Service) and is entirely in the cloud. It supports builders, project and property developers, facility and property managers as well as portfolio managers all along the life cycle and value chain. The set of functions comprises besides general features like contacts, calendar, tasks and its reminders, specific features such as commissions, deficiency management, value calculations, as well as management of rent and leasing. A unique advantage seems to be the option to reserve, buy and sell, and rent real estates in real time.
A further example is EPIQR® from CalCon.de available in variations for residential and industry units, for the public sector, and for investors. It supports tasks of the development life-cycle phase and usage life-cycle phase. FlowFact.at addresses medium sized and large property companies, whereas small companies with up to five team members are supported with a broker cloud offering functionalities such as matching customers with properties, creating exposés, transfer of property listings to selected portals, and acquisition of new properties. Immoware24.de is another SaaS-solution focusing on property management, specifically on property maintenance service and facility management (rental objects, leased premises, commercial and residential purposes). The software onventis.de is an established cloud procurement system in supplier relationship management (SRM) that is applied in the construction industry. Therefore it can be accounted for the life-cycle phases of realization, utilization and removal. Finally, maklermanager.de is to be mentioned which is part of ImmobilienScout24.de. With its CRM (customer relationship management) features it has a focus on categorization and marketing of real estate objects and supports the administration of a real estate portfolio by application-specific functions for real estate sales and marketing.

4. Discussion and concluding remarks

Based on the described requirements and functionalities (cf. Section 3) we discuss in the following advantages of cloud applications versus in-house solutions, provide a brief outlook on further developments. The relevance of clouds in the real estate sector is determined by three factors: (i) the value of objects in real estate business is relatively high, (ii) some phases during their life cycle cover very long time periods, and (iii) many different actors are involved along the real estate’s value chain, many of them are SME's. Hence, we summarize on the pros and cons of solutions with server installations in comparison to cloud solutions from a customer’s viewpoint, i.e. any actor involved in the real estates value chain. The major advantage for real estate companies using clouds is the ability to adjust IT-related resource supply to fluctuating IT-related resource demand with short lead times. The use of IT, IT infrastructure and services can be performed in a flexible way with low initial and low fixed costs. Another advantage refers to availability and dissemination of information and its consistence.26 Clouds enable various types of actors involved in the real estates value chain to cooperate across company boundaries with other users simultaneously and efficiently anywhere due to a worldwide access to their databases via Internet. Moreover, they have enhanced speed and scalability; as a consequence, employees may focus on their core competencies. As part of the service, updates, further developments, maintenance and data protection are included. No additional cost for IT-infrastructure, platforms and/or software will occur.12,27,28,29 Based on a service level agreement with a provider, cloud customers have access to interconnected services;30,31 they might profit from the end-to-end private network without any data transfer via internet.32

However, from a customer’s point of view risks such as reduced security of the collected data as well as privacy and legal issues are inherent with cloud solutions.33,34,35,36,37 In-house IT solutions make companies independent from a hosting provider. Furthermore, no internet connection is needed. Data can be made accessible with a virtual private network.

A sector-analysis of the real estate business together with the analysis of selected software products gave insight into the requirements of real estates business and the spectrum of applications in the real estate sector. It can be observed that cloud solutions for the real estate sector either support facility management tasks or/and sales and marketing activities. Therefore users of such solutions are facility managers and/or real estate brokers and agents. Cloud computing is especially of interest for SMEs in the real estate sector as it enables high-value functions at low cost. From an economic and business performance point of view it can be assumed that those features are most efficient for SMEs that support cooperation, collaboration and a wider network to be able to reach a wider range of potential customers.

The improvement of cloud infrastructure and cloud environments seems to be one of the biggest challenges for the IT-industry, researchers and managers, within the upcoming years. This includes the integration of advanced clouds and cloud-based services with customized solution to a capital-intensive and – so far – prosperous sector such as real estate where mobility may contribute to the value generated alongside the supply chain.
References


