

The 34th annual congress of April 10-14 this year took place in Bonita Springs (Florida) where the professionals in real-estate education and research discussed six themes: global economy and capital flows, real estate market cycles, demographic effects, future-proof real estate, disruption in technology and future educational models.

The six themes of this congress were the result of the more than 120 participants who participated in the Critical Issues Seminar in Coronado, San Diego last year. As with the previous nine years of these ARES meetings, the central goal of the meeting is to focus on education and research strategies and action plans that can close the gap between the real estate profession and the academic world. This makes real estate education and research more relevant and better utilized within the various professional and academic sectors of the real estate economy. The large variety of the many panels that took place included many different perspectives in 105 sub-sessions.

The influence of technology on the valuation of real estate is also presented in various themes. The impact of technological changes on real estate and the real estate sector is considerable. Proptech is developing very fast, but can this be expressed in a valuation of real estate as we can and should do with sustainability? Big data too - we have a lot of data, but do we know how to ask the right question to make this data accessible? – will influence the potential impact on demand, supply and financing. All questions that the Congress tries to answer with many researches. In seven presentations of research into the digitization of real estate and its influence on the development of real estate, two of the 105 sessions presented, explained and commented with approximately 500 participants: (1) Technology & Housing Dynamics and (2) Big Data & Urban Dynamics:

	Reserach	Author(s)
1	The Impact of Blogging on the Key Metrics of Price, Marketing Time, and Likelihood of a Transaction for Residential Properties	Ksenija Bogosavljevic, Denise H. Gravatt, and Ken H. Johnson (Florida Atlantic University)
2	Twitter and Housing Markets	Kimberly Winson-Geideman (University of Melbourne), Triss Ashton (Tarleton State University), Nicolas Evangelopoulos (University of North Texas)
3	Business Case Qlinker: A Digital Housing Corporation in the Netherlands	Jan Veuger (Hanze University of Applied Sciences), Danielle Koeken (Mitros)
4	Real Estate Transport Protocol: A Hub-and-Spoke Messaging System for Next Generation Multiple Listing Services	Corey Leong (University of Central Florida)
5	Digital Cities: Real Estate Development Driven by Big Data	Herman Alexander Donner (Royal Institute of Technology, KTH), Kent Eriksson (Royal Institute of Technology, KTH), & Michael Steep (Stanford University)
6	The Driving Forces Behind Real Estate Digitalization	Daniel Piazzolo (THM Technische Hochschule Mittelhessen)



I. THE IMPACT OF BLOGGING ON THE KEY METRICS OF PRICE, MARKETING TIME, AND LIKELIHOOD OF A TRANSACTION FOR RESIDENTIAL PROPERTIESⁱ

Bogosavljevic, Gravatt and Johnson(2018) writing in their abstract that ‘digital marketing decisions are no longer solely in the hands of real estate brokers. Property sellers not only determine if the property will appear online (or not); they also decide what, if any, other digital marketing efforts may be associated with their online property listing. This is due in large part to a settlement between NAR (National Association of Realtors) and the DOJ (Department of Justice) concerning third party comments. In this study, we examine the impact of the seller’s choice to allow third-party comments concerning their residential property wherever it is posted online. The field definition coded as *blogging* in many MLSs (Multiple Listing Services) is investigated for its effect on property price, property marketing time, and the likelihood of a transaction of a property during a given marketing period. Findings suggest that *blogging*: (a) has a positive impact on selling price, (b) slightly reduces marketing time, and (c) leads to a not able increase in the probability that a property will sell and close during a given marketing effort. This new knowledge should allow for a better understanding of the impact of digital marketing, in general, and *blogging*, in particular, as the industry moves forward into an environment of greater and more intensive digital marketing efforts.’

II. TWITTER AND HOUSING MARKETSⁱⁱ

Winson-Geideman (2018) states in her abstract that ‘this research analyses the content and sentiment of Twitter data collected over a four-year period from mid-2013 through mid-2017. The data were collected using scripts written in the programming language R that were specifically designed to capture Tweets containing hashtags or terms related to houses, house prices, and mortgage/interest rates. Data were captured on a daily basis, and the raw data set includes almost 14 million Tweets. The specific hashtags and terms that were collected and are relevant to this research include: home price, home value, housing, house price, house value, home, housing, inflation, interest rates, mortgage rates, mortgage, and mortgage rates. Other terms and hashtags collected include: condo, real estate, real estate, and realtor.

Tweets are categorized into two groups—the first related to house prices and the second to mortgage/interest rates. They are also grouped on a monthly basis and retweets (RT) and duplicates removed. The data are analyzed using Latent Semantic Analysis for topic extraction and lexical based sentiment analysis, which produces a scoring index that describes sentiment, opinion and/or emotion (Liu, 2015). A dictionary approach is used for sentiment analysis, where the text (Tweets) are compared against lists of positive and negative words. Both programs are run in R.

While we continue to work through the details of the topic extraction, the preliminary sentiment scores appear to contain the type of information that may be useful to predictive modeling. The following graph shows the difference between the score for month t_i and the preceding month for the sample of Tweets using the term house price. While there is a noticeable fluctuation amongst the monthly scores, the time series also shows some noticeable trends as well as extremes that may provide in sight to future analyses. We expect to develop this into a 3-month rolling average, reflecting the averages used in well-known house price indices. It is important to note that what is shown is very preliminary and strictly for example purposes.

This subject of this research paper will be limited to the results generated from the sentiment and content analyses. The expectation is, however, that in future studies the data will be fitted to regression models using mortgage and house price data as dependent variables to explore and estimate the predictive nature of Twitter content and sentiment. The frame work for this research is drawn from Asur and Huberman (2010) study that uses Tweets to predict box office revenue for films and the Bollen, Mao and Zeng (2011) research that uses Twitter to predict movements in the Dow Jones Industrial Average.’

III. BUSINESS CASE QKLINKER: A DIGITAL HOUSING CORPORATION IN THE NETHERLANDS

Making progressive decisions in the current market organization is complex (Veuger and Koeken 2018). In view of the exponential growth of digitalization and the related possibilities such as the modernization of service, it is crucial to be able to act completely freely. This implies, among other things, that no restrictions are imposed on the past. This includes, for example, current processes, tenant expectations and the current ICT landscape. Therefore, it was chosen to gear up and crystalize these ideas in the form of a start-up. An all-new, digital corporation, powered from the smartphone. This offers the opportunity to start with a sharp digital vision and the pursuit of a future-proof Mitros. This new startup will be incorporated under the name qlinker.

Concept

As already stated, making progressive decisions in the current organization is complex. In view of the exponential growth of digitalization possibilities and modernization of service (Veuger 2017/ Van der Veer, Boekee, Peters 2017), it is crucial to be able to act completely freely. This implies, among other things, that no restrictions are imposed on the past. This includes, for example, current processes, tenant expectations and the current ICT landscape. Therefore, it was chosen to make the gear in the form of a start-up. An all-new, digital corporation, directed from the smartphone. This offers the opportunity to start with a sharp digital vision and the pursuit of a future-proof Mitros. This new startup starts under the name qlinker. Developing a start-up in addition to current operations is not new and has already been successfully applied at other firms such as, among others, Aegon (KNAB Bank 2013), ABN AMRO (MoneYou 2016) and Allianz (AllSecur 2017). These renowned settings use startups to be future-proof in a more viable and efficient way and to match the changing characteristics, wishes and demands of their customers. This organization, along with the disruptive startups mentioned earlier, can inspire us to use the social media resources efficiently and customer-oriented instead of relying solely on the traditional way of working.

Digital Housing Corporation qlinker

In order to respond to these developments and the resulting changes, qlinker has been developed. Qlinker is a fully digital housing corporation that serves its customers and works with an inclusive thought-process. Thus, qlinker will offer the consumer a fully digital experience, as a start-up would via an App or Responsive Website, but offer a wide range of other services and functionalities. The customer can handle almost all his business, in relation to the landlord, completely digitally, when of where it suits him or her. This will have to lead to a tenant rating of 9+ while significantly reducing operating expenses relative to the traditional organization through more efficient processes. Qlinker thus offers a time and place-based service to its customers. The point of departure in this respect is that the property that the customer is renting from qlinker is well maintained. In addition, this home meets the needs of the consumer more closely, and the possibilities for climate-neutral housing are closely monitored. When setting up qlinker we will build our ecosystem around the customer from a digital point of view. The processes are hereby implemented intuitively, with a low-threshold, more efficiently and more effectively than in the traditional manner. The convenience for the tenant is central to this process and is managed to let the customer act as co-designer. On a large number of points, qlinker will differ significantly from traditional housing corporations (Veuger 2014): (a) The customer is not only central but also self-supporting, (b) Customer is a co-designer of the services of qlinker and is actively involved, (c) all relevant customer processes and customer contacts have been digitized, (d) qlinker has an inclusive basis: in spite of the far-reaching digitization, qlinker provides excellent service to vulnerable audiences, (e) qlinker is available 24/7 and 365 days a year for its customers and (f) qlinker enables more efficient and effective use of resources. As a result, operating expenses are expected to be lower than with traditional housing corporations.

Costandsavings

As much as it is difficult to accurately evaluate costs, it is also difficult to predict the returns and cost savings. However, based on the characteristics of the organization and vision of qlinker, an estimate can be made in regards of the cost savings. In this way, business processes will be more efficient and effective, resulting from digitalization with lower operating expenses: (a) qlinker is expected to reduce operating expenses by approximately 10%, (b) digitalization, coming with a high degree of automation will streamline the work flow. A cost saving of 5% - 30% is considered to be achievable; these include capacity costs, waste costs, transaction costs, process costs, etc. In contrast, new costs may also arise for investing in resources and (new types of)

functions within qlinker and applying a customer centric approach to the device application not only eliminates all the wastes linked to the process but also helps focus on the customer.

Conclusion

In addition to these potential savings and regular revenues from the digital housing corporation, we also see several opportunities to further increase revenue and cost savings. For example, the possibilities of data analytics will be investigated. Due to the modus operandi, qlinker will acquire a substantial amount of data. By making good use of these data and the available methods and techniques, qlinker can significantly increase its predictive capability. This allows many actions to be planned proactively instead of unplanned and reactive. This will often lead to lower costs in practice. In addition, data analytics can also benefit the decision making process, development and maneuverability of the organization. When quantified, we see a possibility of far-reaching cost savings that are not currently possible without digitalization.

Comments

Also comments were made at the presentation on the American Real Estate Society bij Winson-Geideman (2018) for further research:

- Opportunities:
 - o Apps are the next stage of technological adaption in property management, particularly as it applies to repair requests.
 - o Blockchain technology will provide more efficient and secure transactions as well as an immutable record of those transactions.
- Challenges:
 - o Mitros serves a low-income, multilingual clientele. How do you expect to overcome demographic barriers such as educational attainment, age, and language as it pertains to the use of the app?
 - o What are the advantages of using qlinker over other house search apps when qlinker is limited to just Mitros?
 - o To use predictive analytics, you will need to collect data from tenants on a regular basis. What type of data will be collected? What will data retention and security look like? Have privacy issues been considered?

IV. REAL ESTATE TRANSPORT PROTOCOL (RETP): A HUB-AND-SPOKE MESSAGING SYSTEM FOR NEXT GENERATION MULTIPLE LISTING SERVICESⁱⁱⁱ

Leong (2018) states in his abstract that ‘current Multiple Listing Services (MLS) operate as isolated systems due to tight coupling to their local markets and a lack of interoperability for provisioning listings outside of their local areas. Moreover, these legacy MLSs act as controlled gateways eliminating a network effect for maximizing marketability of listings to non-local buyers. This paper proposes a new, distributed messaging protocol called Real Estate Transport Protocol (RETP) for resolving weaknesses and inefficiencies present in today’s legacy MLSs. RETP provides a fire-and-forget messaging transport over assigned Internet port 32811. Implementing a virtualized infrastructure, RETP’s messaging protocol creates a hub-and-spoke network topology for provisioning listing messages to a centralized hub from connected nodes acting as network spokes similar to FedEx’s package shipping model. The results of this research offer three messaging use cases: node to hub, node to hub to node, and then finally, node to hub to multiple nodes. Immediate benefits realized from the implementation of RETP include, but not limited to, network scalability, data redundancy, and the potential of a national multiple listing service.’

V. DIGITAL CITIES: REAL ESTATE DEVELOPMENT DRIVEN BY BIG DATA^{iv}

Donner, Eriksson and Steep (2008) states in there abstract that ‘urban environments are composed of urban population, urban infrastructure, city governance and commercial markets within cities. The rapid growth of emerging technologies for sensing and communicating data is being leveraged by commercial companies to create digital applications where machine learning applications analyze multiple kinds of data now available from instrumented infrastructure, public and private urban transactions and citizens’ mobility to transform urban environments. This kind of transformation is our view of what enables a “digital city”. Commercial markets are

at the heart of this concept, with commercial applications of digital infrastructure rapidly developing, because data from multiple sources are more easily available and analyzed across multiple data layers drawn from different sectors and regions of the city. It is now possible to visualize multiple kinds of outcomes across an entire city and its markets, and to do “What if?” analysis using predictive analytics to generate new insights and financial models across a wide range of vertical urban services. The ability to visualize real time data and insights drawn from that data about the urban environment that surrounds real estate and identify its connection with real estate value provides an unprecedented potential for enhancing real estate development decisions, primarily through better forecasts for building utilization, more accurate assessment of the purchasing power of users of real estate, and by better risk assessment of real estate users. This article presents an analysis of the potential benefits of digital cities for real estate development decision making.’

VI. THE DRIVING FORCES BEHIND REAL ESTATE DIGITALIZATION

Piazolo (2018)^v presented his research *The Driving Forces Behind Real Estate Digitalization* at the American Real Estate Society Congress in Florida. He presented his research results in four chapters: (1) data and digitalization, (2) digital business models and applications, (3) digital business models and driving forces and (4) hypotheses about developments in the real estate area.

When we look at data and digitalization we see a couple of movements: (1) data are the new currency of our time, (2) artificial Intelligence is the new electricity (Andrew Ng Baidu^{vi}), (3) digitalization is not the implementation of another software, (4) digitalization is the change of the business model, (5) key activities are data Generation, data interpretation, distribution of insights and (6) value creation chain moves from the real world into the virtual world. Based on an inventory (Piazolo, 2018) of business models on the basis of digital technologies and applications he comes to the next overview.

	Business Model	Application
1	Crowd Investment	Online investment products
2	Big Data / Smart Data	Data management, analysis, reports
3	BIM / Property Management	Efficient use and management
4	Online Brokerage	Digital broker
5	Online Market Place	Digital consolidation
6	Smart Building	Use of sensors and Internet of Things
7	Smart Services	Digital contracts and transaction management
8	3-D-Printer	Flexible production and layout

Source: *Business models on the basis of digital technologies and applications (Piazolo 20008)*

An example from application to driving force is the business model smart services and application digital contracts and transaction management: computer algorithms to represent contracts or to support execution of contracts. Additional written fixing of contracts becomes redundant and many types of contracts become self-executable. Benefits for smart contracts are higher safeness of contracts and reduction of transaction costs. The driving forces of smart services are new standards and new processes. Thereby Piazolo (2018) presented an overview of business models on the basis of digital technologies and driving force.

	Business Model	Application
1	Crowd Investment	New offer
2	Big Data / Smart Data	New contents and new insights
3	BIM / Property Management	Raising efficiency / Increasing transparency
4	Online Brokerage	Raising efficiency
5	Online Market Place	Increasing transparency
6	Smart Building	New offer
7	Smart Services	New standards and new processes
8	3-D-Printer	Enhancing flexibility

Source: *Business models on the basis of digital technologies and driving force (Piazolo 2018)*.

As Piazzolo states in his presented research results are the driving forces of digital technologies: (1) increasing transparency, (2) raising efficiency, (3) enhancing flexibility and (4) enabling new opportunities, new contents, and new insights. These four formative characteristic will also describe future new developments in real estate within a few years. Piazzolo concluded that Companies that fulfill with their business models these characteristics will prevail against competition and otherwise crowding out through competition. He also mentions a couple of hypotheses for discussion for digitalization and real estate: (1) transparency-pressure will increase, (2) platforms will continue to gain importance, (3) frictionless execution of all secondary processes around bought product is expected, (4) quality and credibility are demanded, (5) power of control about data as important as staff and (6) processes automated, but staff is more flexible.

VII. A REAL GAME CHANGER IN REAL ESTATE: BLOCKCHAIN

Does real estate still have the value that it once had, or will the valuation of real estate change due to surprising products and services, innovative business models, different market strategies, innovative ways of organizing and managing in the (real estate) markets? Innovation revolves around good facilities in an attractive and stimulating environment. Take disruptive real estate. The driving force behind these developments are new technology, viability, organizing differently and managing, and these have a big impact on the valuation of real estate. Established names like Nokia, Kodak, Blockbuster, Oad, Free Record Shop, Hyves and V&D collapse, and others, like Hema, Shell, hotel chains and healthcare institutions are the least bothered by it. However, disruptive organizations like Amazon, Zalando, Uber, Tesla and its competitor Faraday Future, who wants to exceed Tesla in everything, clearly respond to viability in the environment, and this is determinative for competitive strength and thus impacts the current and future valuation of real estate. Blockchain – a distributed database that contains a growing list of data items and that is hardened against manipulation and counterfeiting - plays an important role in that. The notaries and brokers have already experienced this in the recent period, and it will continue to have an effect on real estate owners, financiers, users, builders, brokers, notaries and the cadastre.

Blockchain and the real estate sector

The financial sector has become excited about how Bitcoin has programmed the value transfer and how the transactions are processed without having a third party, such as the government or bank, part of a transaction. All banks worldwide have their own IT systems that are complicated, communicate inefficiently and let transactions take place. There is a realization that this can be much simpler with a customized open-source protocol. And why would that not apply for real estate? An important discussion about this theme also concerns the cadastre, with the registering of property ownership. Blockchain can be a more efficient way of registration in order to transfer ownership. However, the critical footnote should be placed here that real estate also exists in the real world in trading with Blockchain. There will have to be a clear connection between the administration in Blockchain and the physical property. At this time, this connection is not (yet) scientifically proven. What we see is that heavy investments are being made in, for example, a new global registration system on the basis of Blockchain and that established parties see opportunities to make processes simpler and to develop more user-friendly systems. Key advantages of Blockchain is that changes can no longer be made once a block has been added. This means that errors must always be corrected before a transaction can be done. Adjustments always remain visible in Blockchain, thus keeping the registry transparent and providing the basis for trust in the system. This allows, for example, duplicate expenses to be avoided and no shadow transactions can occur.

With the help of Blockchain, we can bring together all information about buildings and give access to parties who need the information. It then works as a kind of building passport. Thus, a data room is created in which different information from buildings is stored. Any interested party can add information from, for example, tenants, valuations, history and maintenance plans. Banks can also check the financing more easily and monitor, for example, cash flow. According to Yermack (2017), professor and expert on Blockchain, the work now done by auditors will disappear. With the Building Information Model (BIM), data will also exchange information about design and materials use that can contribute to a circular economy. Demolition of a building and responsibilities for installation technology become more transparent and clearer with BIM. With a change of ownership, it is also very easy to change the complete building passport. Other examples of application areas include title registration, service costs, real estate as a service, building maintenance, settlements of various forms of taxation, real estate valuations such as the WOZ, refurbishment value for insurers and records of an Association of Owners.

Two changes

The real estate sector will also face two fundamental changes: (1) the use of the Blockchain in the real estate sector itself and (2) the broad social impact as a result of the users of real estate. A first major change through the application of the Blockchain is in the registration and processes of real estate titles, due diligence processes, simplification of currently complex transactions, faster turnaround times of transactions and more liquidity (Wessels 2016). Blockchain's technology allows contracts to be smart and can therefore be executed under predetermined conditions. Real estate finance can also be further automated with Blockchain, or it can contribute to the simplification of crowd funding. The big advantage of these movements is that the real estate market will become more transparent, the quality of (real estate) data will increase and fraud prevention becomes more effective. The second major change is the social impact as a result of designating the users of real estate. If we draw a comparison with the developments with the internet and its impact - see the social impact of smartphones - new patterns of users or real estate will change significantly. Existing institutions will disappear or change significantly, other parties will rise.

Disruption in full swing

Wensing, Director of Investment Management at Amvest, outlines how disruption is in progress. The traditional model for all sectors is under pressure. Innovations are necessary and offer opportunities. As a real estate company, you must make a connection between technology and other megatrends through structured preparation and approach. Amvest recently won the tender together with Synchron for a 350-dwelling residential building at the Koningin Julianaplein in The Hague. What is unique about this project is that for the first time such a building is being developed on this scale without parking for residents. The young target group has much less need for a car. Amvest is going to invest in facilities to enable auto sharing. Wensing also sees major developments looking at likes on Facebook of housing offerings. For example, we are already ready in the housing market for a 'Funda II', where the property manager can link his offer much better. *'There is hardly any real estate agency involved for our new construction projects.'* Wensing also predicts a great future for domotics, the use of electronics for the automation of processes in and around the home (Wessels 2016). Van Rhijn, partner and chief executive officer of Netherlands Colliers, points out that real estate seems to be lagging behind other markets. Colliers wants to change that and sees different possibilities. In 2009/2010, Boer Hartog Hooft joined Colliers, partly because of the insight that it is time to say goodbye to the activities in housing brokerage and to look for activities that had higher added value. Van Rhijn predicted, among other things, that as a result of digitization and social media, the office market will increasingly resemble the hotel market, where liking and reviewing has become a matter of course. *'It is even true that reviews and likes for the hotel market are a better basis for determining the value of a building. That will also become very important for the office market'* (Wessels 2016 in Veuger 2017).

The real estate world finds itself at a tipping point of a transition: a dramatic and irreversible shift in (real estate) systems in society. This abstract based on research (Veuger 2018) is a State of the art of Disruption, Blockchain and Real Estate in the Netherlands and international.

VIII. CONCLUSION

In conclusion, we can draw seven conclusions from the studies described above:

- Findings suggest that *blogging*: (a) has a positive impact on selling price, (b) slightly reduces marketing time, and (c) leads to a notable increase in the probability that a property will sell and close during a given marketing effort.
- The expectation is, however, that in future studies the data will be fitted to regression models using mortgage and house price data as dependent variables to explore and estimate the predictive nature of Twitter content and sentiment.
- A cost saving of 5% - 30% is considered to be achievable; these include capacity costs, waste costs, transaction costs, process costs, etc. In contrast, new costs may also arise for investing in resources and (new types of) functions within qlinker and applying a customer centric approach to the device application not only eliminates all the wastes linked to the process but also helps focus on the customer.
- The results of this research offer three messaging use cases: node to hub, node to hub to node, and then finally, node to hub to multiple nodes. Immediate benefits realized from the implementation of RETP include, but not limited to, network scalability, data redundancy, and the potential of a national multiple listing service.

- The ability to visualize real time data and insights drawn from that data about the urban environment that surrounds real estate and identify its connection with real estate value provides an unprecedented potential for enhancing real estate development decisions, primarily through better forecasts for building utilization, more accurate assessment of the purchasing power of users of real estate, and by better risk assessment of real estate users.
- As Piazzolo states in his presented research results are the driving forces of digital technologies: (1) increasing transparency, (2) raising efficiency, (3) enhancing flexibility and (4) enabling new opportunities, new contents, and new insights. These four formative characteristic will also describe future new developments in real estate within a few years.
- The real estate world finds itself at a tipping point of a transition through blockchain: a dramatic and irreversible shift in (real estate) systems in society.

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ⁱ <http://ares18.be.uw.edu/wp-content/uploads/2018/04/ARESprogramApril102018website.pdf>

ⁱⁱ <https://www.etnpconferences.net/ares/ares2018/PaperSubmissions/Submissions2018/S-2018-185.pdf>

ⁱⁱⁱ <https://www.etnpconferences.net/ares/ares2018/PaperSubmissions/Submissions2018/S-2018-124.pdf>

^{iv} <https://www.etnpconferences.net/ares/ares2018/PaperSubmissions/Submissions2018/S-2018-304.pdf>

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