

# Expertise and decision making in real estate appraisal: results from a naturalistic study

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## ABSTRACT

**Introduction:** This paper presents the results of the application of Applied Cognitive Task Analysis to the domain of real estate appraisal. The research into appraiser decision making has been dominated by the behavioral tradition based on rationalistic models. Naturalistic approach allows a new insight into expertise and the cognitive processes of real estate appraisers. **Method:** The data have been collected in the interviews with 10 Austrian appraisers and analyzed by means of thematic coding. **Results and Discussion:** Typical cognitive elements of expertise were revealed in the interview transcripts including metacognition, use of analogies and professional intuition. Sensemaking is the main cognitive process of real estate appraisers and the Data-Frame Theory of Sensemaking can best explain appraiser decision making. These findings will have implications on the decision support and training in the domain.

## KEYWORDS

*Expertise; real estate appraisal; ACTA; sensemaking; data-frame theory.*

## INTRODUCTION

### The problem of real estate appraisal

This paper presents a part of a research project that focuses on the decision making of Austrian real estate appraisers and explores the requirements for decision support in this domain. Real estate is the main type of assets and it is therefore vital to know its value. However, definition of the property's value is not a trivial task: there are multiple types of values calculated for different purposes. Real estate appraisers are usually commissioned to calculate the *market value* of the property that is an estimation of its most likely transaction price in the open market. However, real property has important physical characteristics: real assets are immovable, durable, scarce, and very heterogeneous. As a consequence, real estate market is characterized by high segmentation, uncertainty and inefficiency. These conditions, on the one hand, provide for the demand for appraisal services, but, on the other hand, also constitute the main challenge in the appraisal profession. The task of the appraiser is to deal with this uncertainty (Crosby, 2000; French & Mallinson, 2000).

### Appraisal uncertainty, accuracy and appraisal procedure

There have been many attempts to model the uncertainty and to measure the related construct of appraisal accuracy. No adequate representation of uncertainty and no adequate measure of appraisal accuracy have been found (Crosby, 2000; Kucharska-Sastiak, 2013). The results of empirical studies on appraisal accuracy are not uniform: the studies with positive results prevail numerically, but there are also studies seriously questioning the quality of appraisal services. Facing the lack of an adequate accuracy measure, professional organizations focus on the regulation of the appraisal process. The sequence of steps is regulated and is binding. However, the regulation leaves a lot of individual decision space for the appraiser in selection of the input parameters for the calculation and the parameters have a crucial impact on the appraisal results.

### Research on appraiser decision making

Behavioral research tradition found its way into the study of appraisal decision making relatively late. The view on appraisal as information processing task under uncertainty originates from Ratcliff (1972). Only eighteen years later Diaz (1990) conducted the first applied study in this tradition. Behavioral studies have covered four main topics: 1) deviations from normative models 2) comparables selection 3) the use of heuristics and biases, and 4) the role of client pressure (Diaz, 1999). Conclusions from these studies are uniform: appraisers deviate from the prescribed normative procedure, they use information cues selectively and are viable to different biases. Typically for behavioral research, deviations from normative models are seen as cognitive risks (Wofford, Troilo & Dorchester, 2011).

An alternative claim was formulated by Hardin (1999) who proposed to test whether expert heuristics are functional and if there is a place for expertise in real estate appraisal. But this claim has not been addressed ever since. Recently expertise has been addressed again in the literature on appraisal accuracy with the claim that

expert appraisers are able to reduce the uncertainty of the input data through their way of information processing (Kucharska-Sastiak, 2013).

## **METHOD**

### **Research objectives and proposition**

Real estate appraisal is a complex cognitive process conducted in complex conditions by industry experts. The success of performing an appraisal task depends on the expertise of the appraiser. No studies have examined expertise in this domain and an understanding of how appraisers make decisions is still lacking.

Naturalistic Decision Making (NDM) is a decision making theory with the focus on complex decision making situations characterized by a combination of the three factors: complex tasks, complex environments and expert decision makers (Cannon-Bowers, Salas & Pruitt, 1996; Salas, 2010). NDM is an alternative approach to Classical Decision Making and it has developed its own decision making models and research methodology that allows to research human cognitive processes. NDM approaches have been successfully applied in many domains characterized by different art of complexity. Provided the characteristics of real estate appraisal, the proposition of this research is that the application of NDM theory and its methods can help to explain the decision making process and expertise in the domain of real estate appraisal.

### **Research method**

The paper presents the results of application of the NDM research methodology in the domain of real estate appraisal. Applied Cognitive Task Analysis (ACTA) methodology (Militello et al., 1997) has been developed based on the findings from the psychological research on expertise and it is therefore targeted to study expertise and cognitive activities in a particular domain. The guidelines for semi-structured interviews have been prepared in accordance with Militello & Hutton (1997). Stage 1 (Task diagram) and Stage 2 (Knowledge Audit) were conducted in full. The probes for Knowledge Audit included Past & Future, Big Picture, Noticing, Job Smarts, Opportunities/ Improvising, Self-monitoring, Anomalies, System difficulties and Scenario from Hell. Stage 3 (Simulation Case) has been carried out with a real-life case without financial figures due to the time constraints and voluntary basis of the participation; the participants had to explain how they would approach the case and what would be the main difficulties. Each interview lasted on average 1.5 hours.

### **Research participants**

Interviews were conducted with Austrian real estate appraisers in German language. The participants have been selected on the basis of their membership in national and international membership organizations and by peer nomination. This paper is based on the results of 10 interviews. The average age of interview participants was 47 years; their track record in appraisal equaled on average 13 years (ranging from 3 to 20 years) and each participant appraised on average 142 properties per year (ranging from 50 to 500 properties).

### **Data analysis**

The interviews were tape recorded and transcribed for the analysis. QTA Miner software was used for data coding and analysis. Thematic coding methodology was applied to code the data and cognitive demands tables were constructed. Thematic coding produced 10 themes (correct/false, better/worse, subjectivity, inaccuracy, coherence, forecasting, knowledge, feeling, and comparison) that could be united into five coding categories: expertise, cognitive challenges, decision making, information cues, and industry conditions.

## **RESULTS AND DISCUSSION**

### **Task diagrams and Knowledge Audit results**

Analysis of task diagrams demonstrated that the appraisal process is highly standardized. All the participants referred to the four general phases as required by the regulatory standards: definition of the scope of work and initial documents screening; inspection of the property; comparables selection and adjustment, and calculation and preparation of the appraisal report. The setting of input parameters has been defined as the most cognitively challenging activity by the majority of appraisers.

Cognitive demands tables have been constructed and 57 cognitive demands have been identified. Cognitive demands could be attributed to the processes of data search, comparables selection, setting of the input parameters, and justification of the results. An illustrative cognitive demands table is presented below (Table 1). In summary, cognitive demands were focused around information search and interpretation.

**Table 1.** Illustrative Cognitive Demands Table (Expert 5)

Cognitive demand	Why difficult?	Information Cues	Strategies
Set the rents	<ul style="list-style-type: none"> <li>It is dependent on 'micro-factors'</li> <li>Subjective judgment required</li> <li>Need to look into the future</li> </ul>	<ul style="list-style-type: none"> <li>Tenant number &amp; structure</li> <li>Financial strength of the tenants</li> <li>Overrent/ underrent</li> <li>Inspection results</li> <li>Maintenance need</li> </ul>	<ul style="list-style-type: none"> <li>Check, adjust, compare to other properties</li> <li>Compare only to properties that you have inspected</li> </ul>
Set the yield	<ul style="list-style-type: none"> <li>This is the key parameter</li> <li>Small changes result into large changes in the value</li> <li>You have to take everything into account</li> <li>You have to anticipate the risks</li> <li>You have to adjust comparables</li> </ul>	<ul style="list-style-type: none"> <li>Market reports</li> <li>Market trends</li> <li>Comparables</li> </ul>	<ul style="list-style-type: none"> <li>To set the yield in the end, after other parameters</li> <li>To observe the market developments</li> </ul>
Quickly get the relevant market data	<ul style="list-style-type: none"> <li>The market activity is low</li> <li>You cannot disclose your informant and some of your data (confidentiality)</li> </ul>		<ul style="list-style-type: none"> <li>Use personal contacts</li> <li>Talk to real estate agents</li> </ul>
Validate the results	<ul style="list-style-type: none"> <li>You have to support your intuition by a calculation</li> <li>You cannot disclose all your information (confidentiality)</li> </ul>	<ul style="list-style-type: none"> <li>Own experience (anticipated price range)</li> </ul>	<ul style="list-style-type: none"> <li>Attention to details</li> <li>Check the range</li> <li>Ask a colleague</li> </ul>

### Complexity of the appraisal task

Understanding of task complexity facilitates the understanding of expertise in the domain. Although time stress is not the main factor in real estate appraisal, the domain is characterized by a number of other features contributing to task complexity. Real estate appraisers have financial liability and have to comply with industry regulations. The major concern of Austrian appraisers is the lack of relevant market data: the information is imperfect and costly. Key appraisal parameters (rents, yields, etc.) are interconnected and complex assignments are characterized by a number of additional features of legal or technical character that increase the cognitive load of the appraisers. To set most parameters, an anticipation of future market development is required (e.g. future rent development, supply and demand in the region, etc.). Finally, several interview participants stated that there are several ways to solve an appraisal assignment and several values that can all be correct if properly supported by the market evidence. These characteristics correspond to the typical characteristics of the NDM situations and imply that expert cognition is important in appraisal decision making.

### Expertise of real estate appraisers

Real estate appraisal is an expertise-dominated domain. Some expertise criteria were stated by the interview participants, other cognitive characteristics were revealed in the analysis of the coded transcripts.

**Self-confidence and metacognition.** Experts demonstrate self-confidence and metacognition (Glaser & Chi, 1988). Interview results revealed that appraisers are generally convinced of their own expertise and the expertise of their colleagues. Appraisers often refer to their superior market knowledge as a source of their expertise and an important source of information. All the participants stated that they are generally sure in their values and there are no really unsolvable projects.

All SMEs demonstrated elements of metacognition. Appraisers not only know when they know but also know when they lack special knowledge (e.g. in unfamiliar markets, in other market segments or when they lack technical knowledge) and admit that they would use an advice of experienced colleagues in such cases. This is in line with the previous findings demonstrating that expert appraisers anchor to other expert's opinion in unfamiliar markets (Diaz & Hansz, 1997).

**Expert knowledge.** Structured expert knowledge is considered the main source of expertise providing for superior problem representation by experts and superior search strategies (Chi, 2011). Professional education supported by several years of professional experience is considered to be the minimal requirement in the appraiser profession. Knowledge base of expert appraisers consists to a larger part of market knowledge organized by cases: expert appraisers just have in their memory many appraisal cases where all the details are known (location, yields, rents, layout, condition, etc.). The knowledge of these cases allows them to draw analogies between cases, match the cases to the subject property and select better comparables. Novices are more likely to apply learned rules and spend more time on looking for comparable data. The interview participants admitted that as a rule they use only 3 to 5 comparables. The quality of comparables is more important than their number and even one or two 'good' comparables can be sufficient.

**High-validity of the appraiser's environment.** Although from the first sight it can seem that real estate appraisal is a domain where valid feedback is lacking, it is not the case. Appraisers stated that they often get feedback from the clients and use the information on the transaction price to validate their results, although it is considered to be a doubtful indicator. Another important source of feedback is communication to the colleagues, either in-house (“four eyes principle”) or from their professional network. All SMEs admitted that they often validate their results by discussing the case with another expert.

**Professional intuition.** Provided high-validity of the appraiser's environment, the domain is favorable for the development of professional intuition (Klein & Kahneman, 2009). In line with the popular proposition that appraisal is ‘*more an art than a science*’, the theme of “feeling” was present in all interviews (Hager & Lord, 1985:23). The SMEs agree that an expert appraiser develops a ‘*feeling*’ of the market and is able to ‘*see*’ the relations between the parameters. Not being able to provide an explanation of how they weight the parameters or define the necessary adjustments for comparables, four appraisers referred directly to their ‘*professional intuition*’ and ‘*a gut feeling*’ as an explanation.

## Cognitive processes

Real estate appraisal is mainly a judgmental activity and sensemaking has been revealed as a dominating cognitive process of real estate appraisers. The Data-Frame Theory of Sensemaking (Klein, Phillips, Rall & Peluso, 2007) has been drawn to explain the cognitive process of real estate appraisal.

**Mental model of the appraisers.** Working on an appraisal assignment can be represented as a process of constructing of a valid mental model or ‘frame’ (Klein et al., 2007). A mental model of appraisers represents a geographical map, provided that location is the main characteristic of the real estate. The key characteristics of the subject property are defined and all cases with the similar characteristics (e.g. all the buildings constructed in the 1900s) are revealed from the appraiser’ memory and placed on the cognitive map.

Although there is a large spectrum of cognitive demands detected in the interviews, most could be attributed to the definition of input parameters. There are two major parameters (rent and yield). Other two important parameters are vacancy rate and operative costs, but they are associated with the rents. The cognitive map of an appraiser is therefore characterized by the criteria of location, rent level and yield level. So, appraisers decide, in fact, based on these three parameters, which confirms the proposition of Klein et. al. (2007) that three to four anchors are used to construct a frame. This confirms also the finding that appraisers use only a part of available information cues (Spence & Thorson, 1998). The appraisal task can be summarized as placing the subject property (‘data’) on the cognitive map (‘frame’) and several interview participants referred exactly to this mental representation.

**Framing.** The first frame is constructed after the scope of work is defined and documents screening is performed. The cognitive map contains the properties for which the details are known and the subject property is placed on this map under the initial assumption that it is a standard property. The quality of the mental model increases with the experience. The models of experts contain more relevant comparables. In case the map lacks details the appraiser has to search for additional comparable evidence. This process can be rather time-consuming for less experienced appraisers (experience is related to specific property type and geographic market segment) and is skipped in case of expert appraisers working in their home market. The result of this step is that the appraiser can anticipate the resulting range of values.

**Questioning the frame and reframing.** In the subsequent stages the appraiser is mainly looking for the property characteristics that are non-standard. As one SME stated: ‘*an appraiser is mostly commissioned to solve hard cases rather than textbook*’. Therefore the appraiser’s job is to look for special characteristics of the property. These details can be revealed during the property’s inspection or they can be discovered by chance in the documents or in the course of communication with market participants. Experienced appraisers admit that they are good at noticing and know from the experience what characteristics can influence the property’s value. New details make the appraiser adapt his mental model. The adaptations can be minor (a lower rent amount) to more significant (use of another calculation method or other type of comparables).

## Cyclical process/ stopping rule

The process of setting the parameters is cyclical: when a problem is encountered appraisers are likely to go one step back and ask for additional information or search for more information cues. Several SMEs stated that they go though the building again and again in their mind, take a look at the pictures of the property, and review the evidence until they assemble the whole picture. The stopping rule has been stated as ‘*a feeling of being right*’ or ‘*when there are no open questions*’.

### **Satisficing instead of optimizing**

The process is prone by satisficing; some appraisers stated that although there is no time pressure as such, the decision has to be made even if the data are not perfect. Two important coding themes were the inaccuracy and the subjectivity of appraisal. The SMEs stressed that appraisal is not a point estimate, but rather a subjective value defined within an objective range of values. On that account each value within the range can be chosen as a market value if it is well grounded by the evidence.

### **Storytelling**

Sensemaking is, in fact, a construction of a story : “*In short, what is necessary for sensemaking is a good story*” (Pirolli & Russell, 2011). The task of the appraiser is to create a story of the property. The major output is the appraisal report, where the story is narrated. ‘*Justification*’ was the second major group of cognitive demands and ‘*coherence*’ was also one of the major coding themes in the thematic coding results. The SMEs admit that the logic and the quality of the report are more important than the appraisal figure itself and writing a coherent report is the ‘art’ of the appraisal profession.

### **CONCLUSION**

The paper demonstrated how the NDM theoretical and methodological approaches can be drawn to explain the cognitive processes and expertise in the domain of real estate appraisal where human cognition has been treated with caution. The research demonstrates the importance of human cognition in the domain. A number of typical cognitive characteristics of experts (self-confidence and metacognition, use of analogies, use of mental models and intuition) have been revealed and the question about the existence of expertise in the domain can be answered with a definite “yes”. The cognitive analysis of appraiser decision making revealed a number of NDM characteristics (satisficing, cyclical nature, holistic nature, storytelling). All the cognitive demands could be attributed to the process of sensemaking. The Data-Frame Theory of Sensemaking (Klein et al. 2007) was selected as the explanation of appraiser decision making process and many findings from the interview protocols could be accommodated within this naturalistic theory. Further research can be conducted, e.g. by means of Critical Decision Method, to study how exactly the main processes of the framing/ reframing occur.

The importance of human cognition and the presence of naturalistic elements in appraisal decision making will have serious implications for the decision support and training in the industry. These implications need to be elaborated in detail.

### **REFERENCES**

- Cannon-Bowers, J. A., Salas, E. & Pruitt, J. S. (1996). Establishing the boundaries of a paradigm for decision-making research, *Human Factors*, 38, 193-205.
- Chi M. T. H. (2011). Theoretical Perspectives, Methodological Approaches, and Trends in the Study of Expertise. In Y. Li (Ed.) *Expertise in Mathematics Instruction: An international perspective* (pp.17-39), New York, NY: Springer.
- Crandall, B., Klein, G. & Hoffman, R. H. (2006). *Working minds: A practitioner’s guide to CTA*, London: MIT Press.
- Crosby, N. (2000). Valuation accuracy, variation and bias in the context of standards and expectations, *Journal of Property Investment & Finance*, 18, 2, 130-161.
- Diaz, J., III. (1990). How Appraisers Do Their Work: A Test of the Appraisal Process and the Development of a Descriptive Model, *Journal of Real Estate Research*, 1990, 5, 1, 1–15.
- Diaz, J. (1999). The first decade of behavioral research in the discipline of property, *Journal of Property Investment & Finance*, 17, 4, 326 - 336.
- Diaz, J.III. (2010). Disrobing beautiful people: an introduction to the special issue of behavioral real estate research, *Journal of Property Research*, 27, 3, 203-206.
- French, N. & Mallinson, M. (2000). Uncertainty in Property Valuation. The nature and relevance of uncertainty and how it might be measured and reported, *Journal of Property and Finance*, 18, 1, 13-32.
- Glaser, R. & Chi, M. T. H. (1988). Overview. In M. T. H. Chi, R. Glaser, & M. J. Farr (Eds.), *The nature of expertise* (pp. xv-xxviii). Mahwah, NJ: Erlbaum.

- Hager, D.P. & Lord, D.J. (1985). *The Property Market, Property Valuations and Performance Measurement*, London: Institute Of Actuaries.
- Hardin, W. (1999). Behavioral research into heuristics and bias as an academic pursuit: Lessons from other disciplines and implications for real estate, *Journal of Property Investment & Finance*, 17, 4, 333 – 352.
- Klein, G. & Kahneman, D. (2009) Conditions for Intuitive Expertise: A Failure to Disagree, *American Psychologist*, 64, 6, 515-526.
- Klein, G., Phillips, J. K., Rall, E. L., & Peluso, D. A. (2007) A Data-Frame Theory of Sensemaking. In R. Hoffman (Ed.), *Expertise Out of Context. Proceedings of the Sixth International Conference on Naturalistic Decision Making* (pp.113-155). Mahwah, NJ: Erlbaum.
- Kucharska-Stasiak, E. (2013). Uncertainty of property valuation as a subject of academic research, *Real Estate Management and Valuation*, 21, 4, 17-25.
- Militello, L. G. & Hutton, R. J. B. (1998). Applied cognitive task analysis: A practitioner's toolkit for understanding cognitive task demands, *Ergonomics*, 41, 11, 1618-1641.
- Pirolli, P. and Russell, D. M. (2011) Introduction to this special issue on sensemaking, *Human-Computer Interaction*, 26, 1-8.
- Ratcliff, R. U. (1972). Is there a “New School” of Appraisal Thought? *The Appraisal Journal*, 40, 522-528.
- Salas, E., Rosen M. A., & DiazGranados, D. (2010). Expertise-Based Intuition and Decision Making in Organizations, *Journal of Management*, 36, 4, 941-973.
- Spence, M. T. & Thorson, J. A. (1998). The Effect of Expertise on the Quality of Appraisal Services, *Journal of Real Estate Research*, 15, 2, 205-2015.
- Wofford, L., Troilo, M. & Dorchester, A. (2011). Real estate valuation, cognitive risk, and translational research, *Journal of Property Investment & Finance*, 29, 4/5, 372 – 383.