Stakeholder Perceptions on Requirements for Accessible Technical Condition Information
in Residential Real Estate Transactions

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Abstract. Buyers of residential real estate frequently experience dissatisfaction with the property they have purchased. Recent findings suggest that insufficient knowledge about the property is a key trigger to ensuing disappointment and claims for compensation. Further, a good technical condition report reduces the probability of dissatisfaction and insurance claims. For the purpose of designing services for improving technical condition information and its flow, we elicited stakeholder perceptions on the suitability of residential real estate technical condition reports. Specifically, we conducted multiple surveys which we content analyzed and used as the basis for a conceptual model of information products and dependencies needed to deliver better information to stakeholders in a real estate transaction process. The conceptual model, in turn, forms the basis for specific service design in future work.

Keywords: Residential Real Estate Transactions · Technical Condition Information · Information Services · Conflict Reduction

1 Introduction

Buying and selling a home is a stressful ordeal. Few other transactions affect the family economy as much, while being based on a limited understanding of what is being transacted, in a relatively short transaction process.

Information asymmetry [9], where one party has more salient information about a transacted product than the other, can lead to market distortions [8,14], where residential real estate stakeholders do not end up transacting the property in question at a sustainable price, thus resulting in dissatisfaction and conflict. More specifically, lacking knowledge on the part of the buyer about the property in question and a good technical condition report have been found to be key determinants of (dis)satisfaction [11].

In this study, we investigate various stakeholders' perceptions on what information is salient in a property transaction process. We also specifically investigate the stakeholders' perceptions on a particular document used in the

Norwegian residential real estate market; namely, a technical condition report written by an authorized property assessor. Then, on the basis of those perceptions, we develop a conceptual model of information requirements that should guide the design of information services that are intended to facilitate stakeholders' information processing during a residential real estate transaction process.

2 Background

Earlier, we conducted a stakeholder journey analysis [6], where we elicited possible technology touch points in a residential real estate transaction process (Fig. 1). The technology in question was "smart" property services (SPT) to support stakeholders in a property transaction process. The services are briefly outlined in Fig. 2, and we will return to a few of them below.

The stakeholder journeys were developed through three workshops with stakeholders, and then refined by the researchers. The analysis was conducted for five groups of stakeholder. Fig. 1) depicts five swimlanes, one for each stakeholder, from bottom to top: the residential real estate buyer, the estate agent, the seller, the technical condition assessor and the insurance company providing latent defects cover, an insurance policy that protects the seller against claims from the buyer after the real estate transaction has taken place.

In Fig. 1, the technical condition report appears as a technology touchpoint in the Technical Conditions Assessor swim lane. Although real estate assessors use digital editing tools to generate technical condition reports, in the analysis, the technical condition report is simply an information source used as input to the touchpoint in the Estate Agent swim lane ("Explain set asking price"). That touchpoint involves the property scoring service (Fig. 2), which summarizes the technical condition of a property in a numerical score between zero and 100 and other metrics that are intended to be easy to grasp. Important goals of providing these metrics are to make it easier for non-experts to grasp the technical condition of a residential property, and also to make it easier to compare the technical condition of different properties. Moreover, several comments in the workshops were related to managing expectations about price. Real estate agents experience that sellers often expect a higher price for their home than agents think realistic according to the technical condition. They also experience that buyers often do not accept that any devaluation for technical condition has already been taken into account in the asking price. Thus, when the assessor has reviewed the property and written the technical condition report, the estate agent can use the property scoring service to document how the asking price is calculated. The user story "Explain set asking price" indicated in Fig. 1 reads as follows:

> Explain set asking price: As an estate agent, I can get a seller to understand the rationale for my suggestion for asking price by using the SPT property scoring service to show the technical condition of the property.

Incidentally, the first version of the stakeholder journey analysis also included the following user story at the same touchpoint:

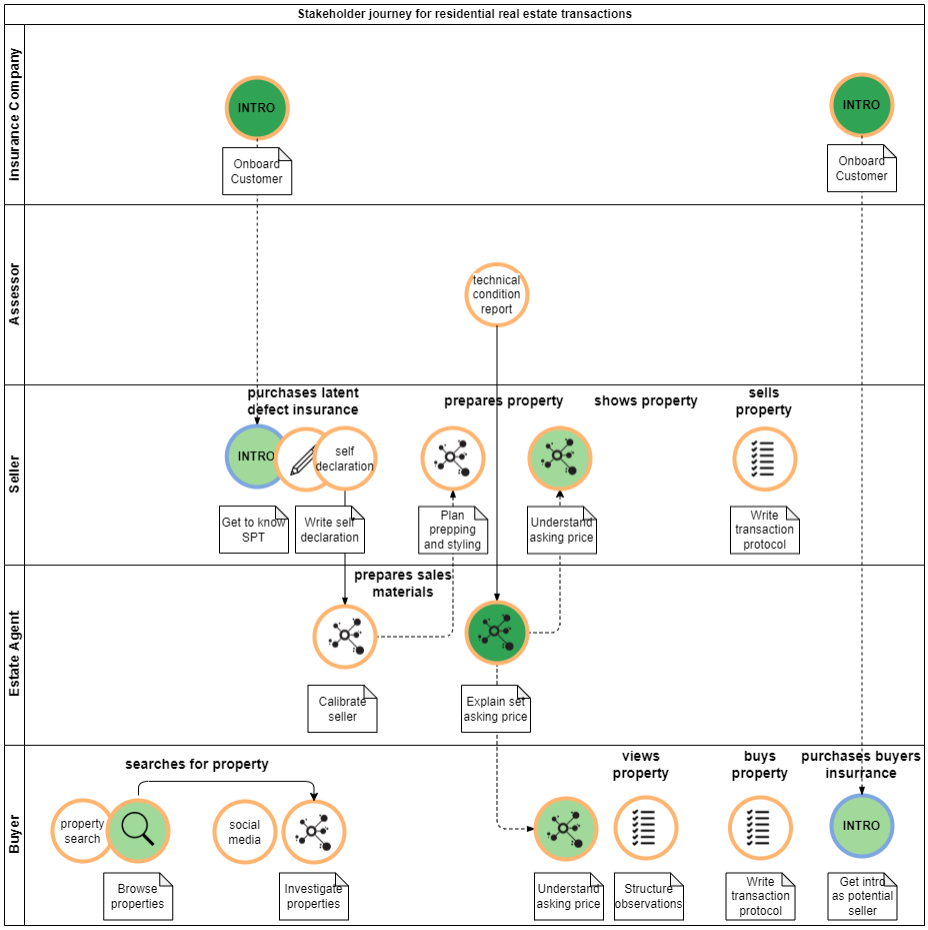

Fig. 1. Planned stakeholder journeys [6].

> Generate sales prospect: As an estate agent, I can generate a sales prospect automatically by using the SPT property scoring service to retrieve key technical information on the property.

However, this user story was later dropped, since estate agents came to the conclusion that automated prospectus generation would probably give little added value to their work.

Starting with the current study, we set out to elaborate on the technical condition report touchpoint. The goal is to suggest service requirements for producing "better" technical condition reports. The intent being that the improved reports should benefit stakeholders directly, and also that they should benefit the functioning of the property scoring service touchpoint in Fig. 1. Indirectly, We also address the "Explain set asking price" and the two "Understand asking

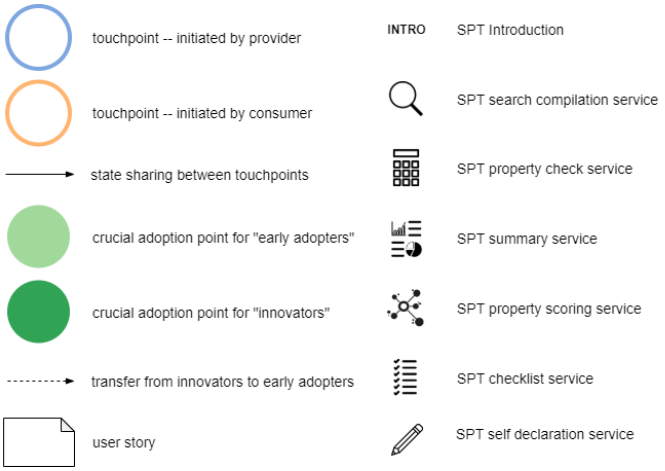

Fig. 2. Symbols for Stakeholder Journey Framework.

price" touchpoints, in the sense that better reports should facilitate the functioning and effects of these touchpoints as well, and also because it may be necessary to help explain and understand technical condition reports even when the reports may be better than before.

The technical condition report is a document prepared by an assessor before a dwelling is sold. The assessor visits the apartment or house and writes down an assessment of the technical condition in a semi-structured form, based on a standard [12]. For each part of the building, the report contains the following: a technical condition grade (TG) being an ordinal scale ranging from TG0 (best) to TG3 (worst) or exceptionally TGNE. A TG0 signifies pristine conditions for a building part not more than 5 years old, while a TG1 signifies an intact building part older than 5 years. A TG2 should be given when there is an observable flaw, or likely grounds (e.g., age or unfortunate circumstances) for expecting a flaw if not observable, that needs attention in due course, while a TG3 signifies an acute need for attention to a flaw. In the case of TG2 and TG3, a textual explanation of probable cause and necessary measures to attend to the flaw is expected. In practice, reports may contain technical terms that buyers, that is, laypersons, have problems understanding. Also, the actual building parts that appear in reports and the organization of reports vary and are to some degree at the discretion of the assessor.

3 Survey

To understand what "better" technical condition reports means, we conducted surveys on the five stakeholder groups, querying respondents on quality issues and on idiosyncrasies (that may not necessarily be unfortunate) that are known

to occur in technical condition reports. The survey focused on the following perceptions of the stakeholder group:

- what information they perceived as most important for prospective real estate buyers prior to bidding
- what problems they perceived that prospective real estate buyers have with the technical condition report
- what information they perceived as most important for themselves in performing their professional function
- their perception of given quality issues with the technical condition report
- their perception of given variability issues with the technical condition report

3.1 Survey Method

We followed survey methodology in [10,13,5]. Specifically, we used semantic differential scales, rather than Likert scales, we used 7-point scales, rather than 5-point scales and we used non-extreme labels (e.g., "not important"–"important", rather than "extremely non-important"–"extremely important").

The survey questionnaires were similar across groups, varying in wording to match the particular group's terminology and understanding. For the professional stakeholders, the questionnaire opened with the following questions:

p1 What single source of information do you see as the most important for potential buyers prior to their placing a bid? *free-text response*

p2 Indicate how important you see the following [information sources] are for potential buyers prior to their placing a bid: *sem. diff. "not important"–"important"*

p3 To what degree do you think potential buyers think it is easy to read technical condition reports? *sem. diff. "to a minor degree"–"to a major degree"*

p4 To what degree do you think potential buyers understand the technical condition report prior to placing a bid? *sem. diff. "to a minor degree"–"to a major degree"*

p5 To what degree do you think potential buyers read the technical condition report prior to placing a bid? *sem. diff. "to a minor degree"–"to a major degree"*

p6 What issues do you think potential buyers experience with technical condition reports? *free-text response*

p7 What single source of information is most important for you in [your role] to [perform your tasks]? *free-text response*

The two first questions were also given in a mirrored form to buyers:

b1 What single source of information do you see as the most important for you prior to placing a bid? *free-text response*

b2 Indicate how important you see the following [information sources] are for you prior to placing a bid: *sem. diff. "not important"–"important"*

and to sellers:

s1 What single source of information do you see as the most important for you to provide when selling a dwelling? *free-text response*
s2 Indicate how important you see the following [information sources] are for you when selling a dwelling: *sem. diff. "not important"–"important"*

For technical condition assessors, p7 was formulated as

c7 What single source of information is most important for the parties in a property transaction *free-text response*

Then the following questions were posed to all stakeholders with stakeholder-specific variants indicated by the square brackets:

a8 To what degree do you find it easy to read technical condition reports? *sem. diff. "to a minor degree"–"to a major degree"*
a9 To what degree do you understand technical condition reports [prior to performing your task]? *sem. diff. "to a minor degree"–"to a major degree"*
a10 How much time do you usually spend reading a technical condition report? *numeric response in minutes*
a11 In [your role], what issues do you experience with technical condition reports? *free-text response*
a12 Overall, how satisfied are you with the technical condition reports [you process in your role] *sem. diff. "dissatisified"–"satisfied"*
a13 Indicate to what degree the following quality deficiencies in technical condition reports affect [what you do in your role]: *sem. diff. "to a minor degree"–"to a major degree"*
a14 Indicate to what degree you think the following variations in technical condition reports are advantageous or disadvantageous for [what you do in your role]: *sem. diff. "disadvantage"–"advantage"*
a15 What is the most important improvement you can see for technical condition reports? *free-text response*
a16 Are there other things you think can reduce discontent and conflict in residential real estate transactions? *free-text response*

The survey was primarily designed for conceptualization, and we did not focus on statistical analyses of the ordinal responses. For this paper, we therefore present qualitative analyses for these questions. For each question with free-text responses, we content analyzed the responses as follows [7]: First, the three authors individually formed categories to characterize the semantic content of the responses. This was done by reading responses systematically and categorizing (coding)[3] phrases in the responses. New codes where declared when needed; otherwise, previously declared codes where used as categories. In this manner, categories were formed *inductively* from the material. Then, the three authors discussed the resulting categories in plenum. Joint categories were synthesized from the discussion. A third *abductive* step was performed on some of the material, in which the researchers formed themes (concepts) from the categories using their knowledge of the domain explicitly [7].

[3]All coding was performed in NVivo (various versions) and Microsoft Power BI.

3.2 Survey Results

The questionnaire in its various forms was deployed as an online survey through channels provided by partners in an ongoing research project. Thus, we used convenience samples consisting of 11 responses from technical condition assessors supplied through an organization that trains and certifies assessors, 14 responses from sellers and 25 responses from buyers supplied through the social media channel of a company developing services for real estate transactions, 30 responses from a real estate agency and 32 responses from a company that processes latent defect insurance claims.

Below, we present figures[4] and analyses for the survey questions. Each heading indicates the survey questions that are addressed.

The most important information for buyers (p1–p2, b1–b2, s1–s2) (p7, c7). The first topic of the survey was what information the participants perceived to be most important for prospective buyers prior to bidding. Question p1 (b1, s1) prompted for unsolicited responses, while question p2 (b2, s2) asked for the relative importance of seven specifically given information sources.

The free-text answers in questions p1, b1, s1, p7, and c7 were content analyzed. The professional stakeholders were asked both which source of information was most important to themselves (p7) and which source of information they thought was most important for the buyers (p1), or, in the case of the assessors, for other stakeholders (c7). The buyers and sellers were only asked about what information was most important for themselves.

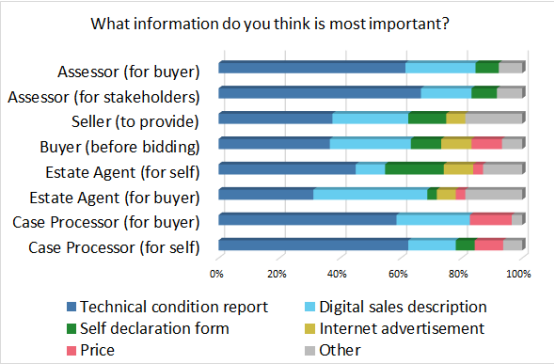

Fig. 3. Stakeholders' classification of information.

[4]To distinguish between data that is based on content analysis and quantitative survey data, we use different colour schemes in figure 3 and in other figures. We use colour schemes that are accessible also for those with colour vision deficiency `https://colorbrewer2.org/#type=sequential&scheme=BuGn&n=3` and `https://personal.sron.nl/~pault/#sec:qualitative`

Most participants cited only one source of information, but some mentioned several sources, such as both the digital sales description and the technical condition report. In these cases, the answer was divided and coded for each source mentioned, so that the total number of information sources counted is greater than the number of participants. Note that the respondents used alternative names and notions for these information sources, thus necessitating the content analysis for these responses.

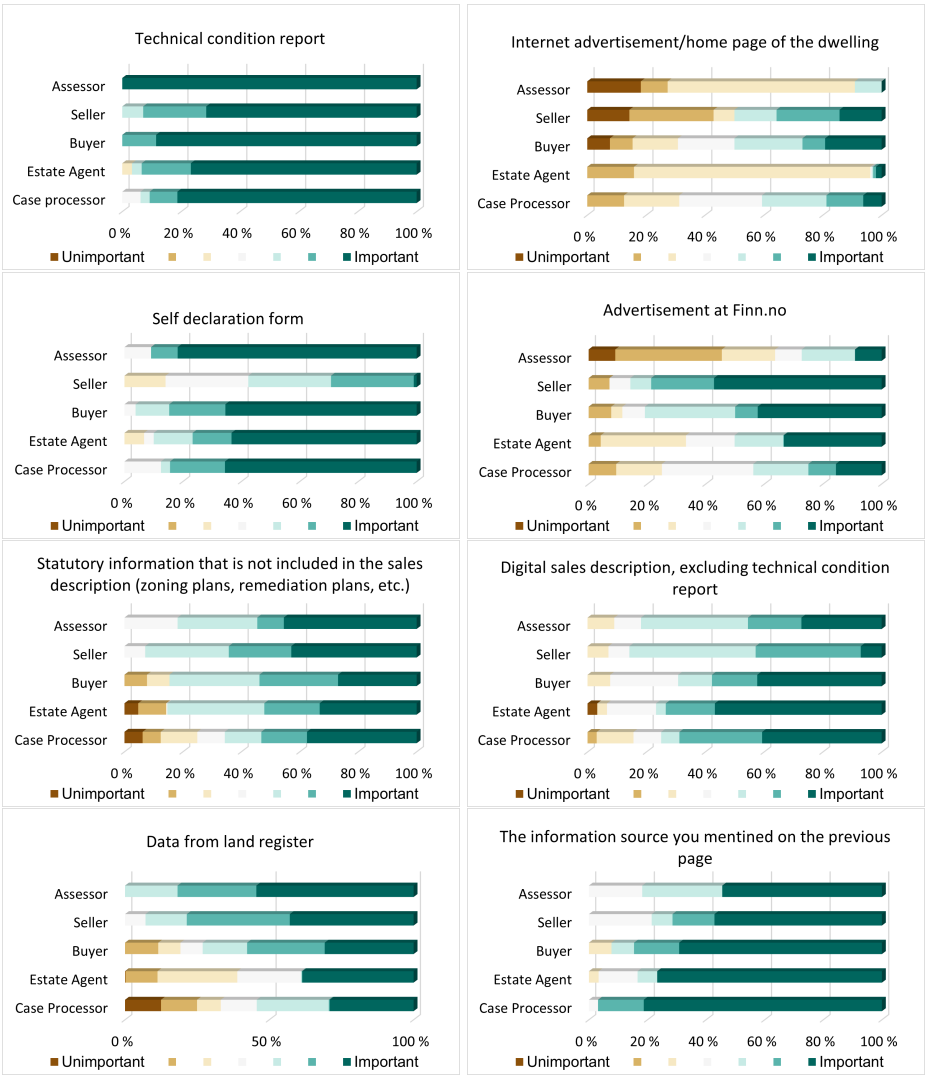

Fig. 4. Importance of information sources.

Fig. 3 presents the resulting information sources from that content analysis, that were mentioned most frequently as the most important information source. These are the technical condition report, the digital sales description, the self-declaration form, the internet advertisement and the price of the residential real estate in question. These categories were all covered by the predefined categories in the semantic differential scale questions, see Fig. 4. We also coded an "other" category for information sources mentioned that were not among the predefined. For case processors, the "other" category contains "damage report" as the most important source. The "other" category for estate agents includes "errors and deficiencies" as the most important information for buyers, while some estate agents mentioned municipal information and land register data as the most important information for themselves. Mentions of "errors and deficiencies" could conceivably have been categorized together with the technical condition report.

According to Fig. 3, the majority of participants from all stakeholder groups consider that the technical condition report is the most important source of information. The figure suggests that the technical condition report is relatively more important for the professional stakeholders than for the seller and the buyer. It also seems that the assessor and case processor to some extent overestimate the importance of the technical condition report for the buyers and the sellers, while estate agents overestimate the importance of the digital sales description for the buyers. For some sellers, buyers and estate agents, price is the most important information. While a few estate agents, buyers and seller mention the self-declaration form as the most important information, none of the case processors do so. This does not mean that this information is not important for case processors; see Fig. 4, left column, second from the top.

For the seven specifically given information sources, Fig. 4 shows responses per stakeholder for the four sources that can be characterized as primarily factual (left column) and responses per stakeholder for the three specific information sources that pertain to marketing and the unsolicited source (right column). By visual inspection, the data suggests that the factual information is rated as more important overall than the marketing information. The technical condition report (left column, uppermost) is the information source that is perceived as most important overall. All technical conditions assessors rated this as important to the highest degree for potential buyers, and the buyers themselves also rate the technical condition report as highly important; see also Fig. 3. The three remaining stakeholders rate the reports as less important, with the sellers giving the lowest rating, which is notable since the seller pays for the report and has the most detailed knowledge of the dwelling. Conversely, sellers give a higher rating to both advertisement information sources than do the other stakeholders.

Our rationale for posing an open question on information sources and then asking respondents to rate a set of given information sources was to see if there might be any social-desirability bias toward the technical condition report being the "correct" choice as the most important information source. Overall, responses to the open question were in harmony with the responses to given information sources, even if a few information sources were not covered by the latter.

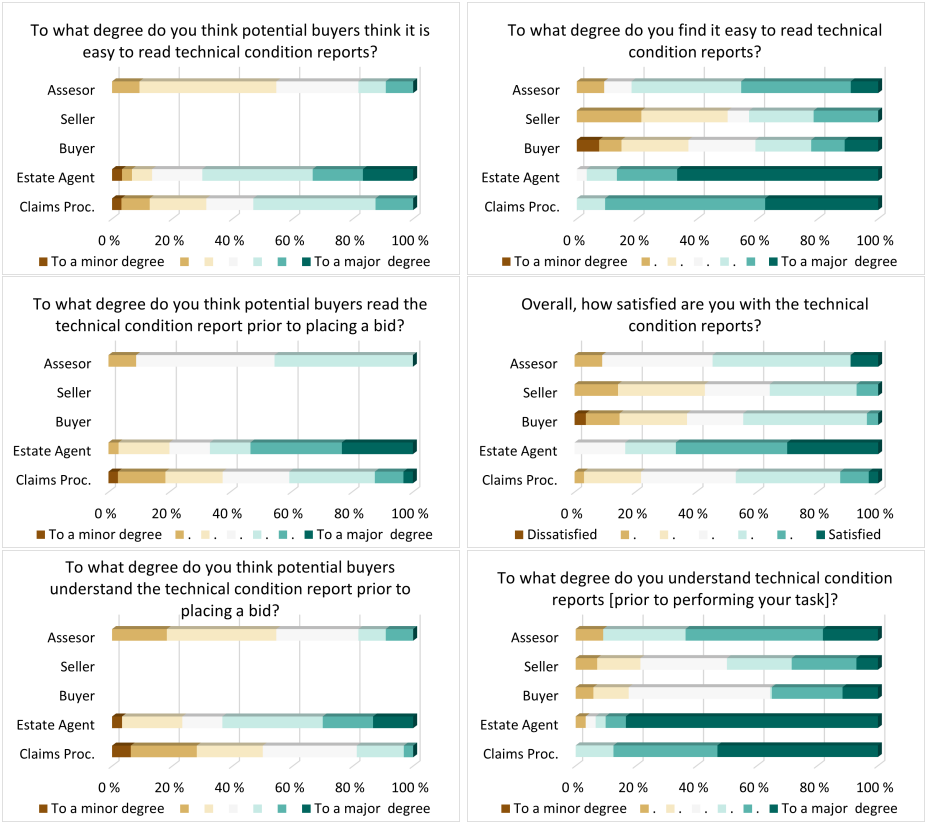

Fig. 5. Accessibility of technical condition reports.

Accessibility of technical condition reports (p3–p5, a8–a9, a12). The next survey topic was the accessibility of technical condition reports. These questions can be divided into two groups: First, there are questions to professional stakeholders—technical conditions assessors, estate agents and insurance claims processors—about their thoughts on buyers' and/or sellers' relationship to reports. The responses to these questions are in the left column of Fig. 5. Overall, among the professional stakeholders, the estate agent has the highest confidence in the buyers' and sellers' ability and willingness to process the reports. The second group of questions, in the right column, were posed to all five stakeholders, and here the stakeholder rates his or her own relationship to technical condition reports. The professional stakeholders claim a higher ability to process reports than the non-professional ones, with the technical conditions assessors claiming a somewhat lower level than the estate agents and the insurance claims processors. The estate agents both claim the highest processing ability and has the highest confidence in the buyers' and sellers' ability and willingness. The assessors and claims processors have low confidence in the buyers and sellers. In

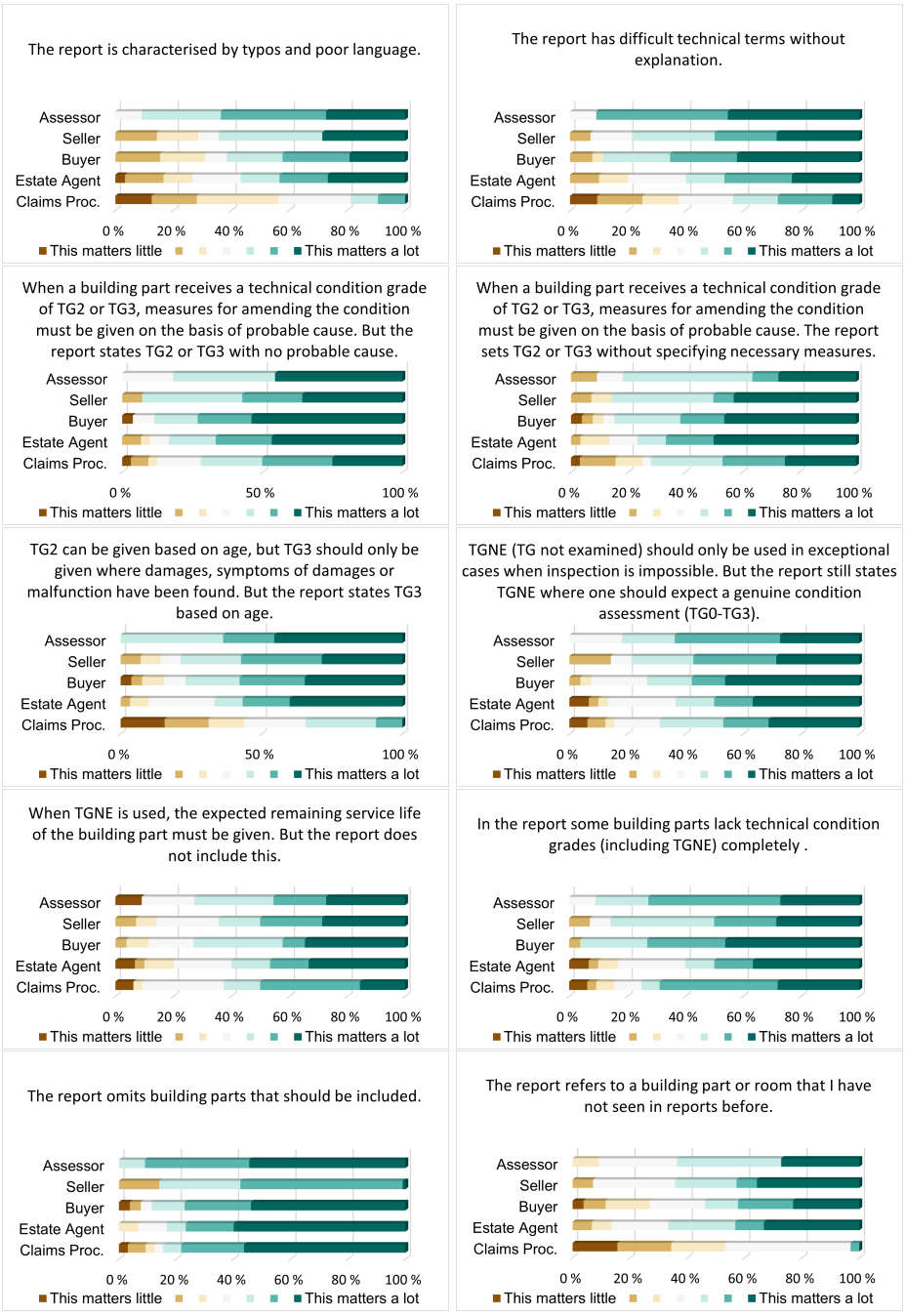

Fig. 6. Perceptions on technical condition report quality issues.

the question on how satisfied stakeholders are with reports in general (middle of right column), the estate agent is markedly more satisfied than the rest, and furthermore, the non-professionals are the least satisfied.

Perceptions of quality issues (a13). The questionnaire listed a selection of known quality issues with technical condition reports and asked stakeholders to rate their seriousness, see Fig. 6. On most questions the technical conditions assessors are more critical than the other stakeholders, whereas the insurance claims processors are generally the least concerned about the quality issues. The latter may be explained by the fact that for insurance claims there is typically processed more resent information, for example, a damage report, that is more important to the claim that the technical condition report.

Perceptions of variability issues (a14). The questionnaire listed a selection of known variability issues with technical condition reports in Fig. 7 and stakeholders were asked to indicate the degree to which they were advantageous or not. These variabilities may be interpreted as the result of decisions by technical conditions assessors in order to capture the observed technical conditions in a report format that does not quite fit. The assessors stand out as the stakeholders that have the most extreme opinions and this may be explained as follows: We are discussing their work so they know more and can have more refined criticisms, but as the same they want the flexibility that variability gives since this could make their jobs simpler.

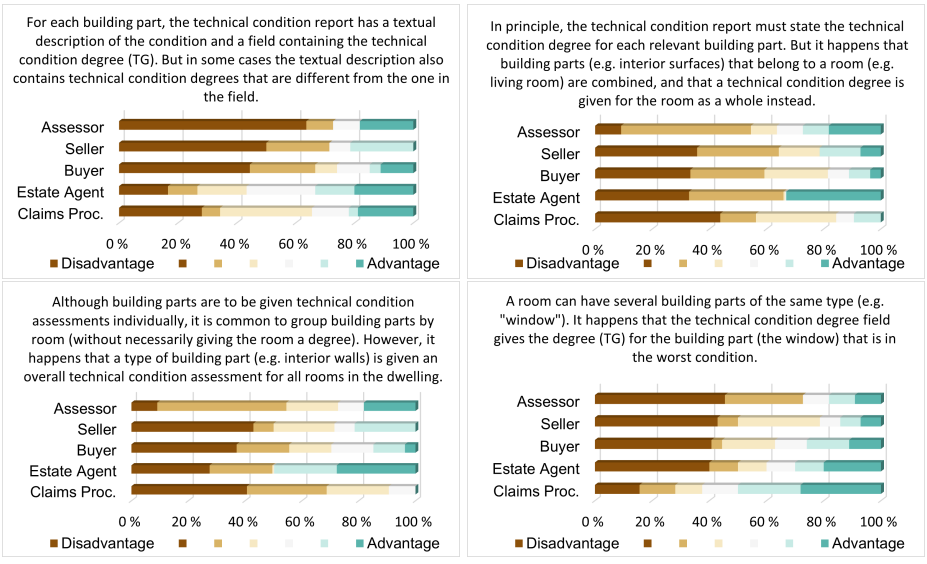

Fig. 7. Perceptions on technical condition report variability issues.

Table 1. Perceived issues with technical condition reports. All stakeholders, joint categories and themes.

Joint category	*Theme*
Inadequate information	Content
Incorrect information	Content
Too much information	Content
Unspecific and ambiguous information	Content
Uninformative	Content
Poor language	Form
Difficult, unclear or messy, illogical layout, repetitions	Form, Standardization
Difficult to find information	Form, Standardization
Difficult to compare information	Standardization
Lack of standardization	Standardization
Poor description	Content
Challenge to explain condition to buyers	Content
Hard to understand or lacking info on consequences	Content
Technical terms	Content
Different understanding and use of grades and age	Assessment
Insufficient assessments	Assessment
Reservations and disclaimers	Assessment
Lack of universal design	Standardization
Questionable neutrality/credibility, due to sales language, seller's expectations	Assessment

Perceived issues for stakeholders in technical condition reports (a11). The questionnaire prompted all the stakeholders to list issues they experience with technical condition reports. We first content analyzed these free text responses inductively per stakeholder. We then categorized the resulting codes into joint categories across stakeholders. For space reasons, we only present the joint categories (Table 1, leftmost column). We only include joint categories representing responses from at least two different types of stakeholders.

In addition, and for the interest of concept building, we constructed themes abductively (Table 1, rightmost column). The theme *Content* concerns the nature of information and its role in communicating with other stakeholders. Examples of challenges include information that is inadequate or incorrect. Too much information can make it difficult to spot the essential information, as can poor descriptions. Other content problems include reports with unspecific and ambiguous information, that are uninformative, hard to understand, with difficult technical terms, or lacking information about consequences of serious flaws.

The theme *Form* concerns inconveniences and difficulties arising from unfortunate, or lacking, informational structure. *Form* is related to the theme *Standardization*, which includes issues on variations of layout and structure and how information is presented. Several of the joint categories in Table 1 are placed in both *Form* and *Standardization*.

Moreover, we have have mapped issues related to difficulties with comparing technical conditions reports and lack of universal design into *Standardization*. Lack of universal design pertains to issues that could have been resolved by adhering to widely accepted standards for digital accessibility and accessible web content [3,4]. These standards are in line with the European Accessibility Act which covers websites and mobile applications provided by public bodies [2]. According to the Norwegian regulations universal design of ICT, private sector bodies must also adhere to the WCAG 2.1 standard [1].

The theme *Assessment* includes inconsistent applications of technical condition grades, inferior inspections and assessments, disclaimers on the part of the assessor and trust issues triggered by sales language and the fact that the assessor's commission is covered by the seller.

Most important improvement to technical condition reports (a15). We content analyzed the free-text responses for each stakeholder on what they see as the most important improvements for technical condition reports. As for the previous question, we compiled the codes for each stakeholder into joint categories across stakeholders shown in Table 2. We then constructed themes abductively from the joint categories. Since this, and the previous question, are thematically similar, themes for this question and for the previous question were compiled together. Question a16 is also thematically similar, but we omit the analysis of this question for brevity, since the contribution beyond what we are already presenting is marginal.

The themes in Table 2 cover improvements on several issues covered by the categories in Table 1. However, there also emerged categories which gave rise to a new theme *Coordination*. Both the coordination of responsibilities and the coordination of specific types of information are mentioned in the responses. Other categories in this theme include illegalities, which are significant in insurance claims, the self-declaration form from the seller and information about technical value. Under *Standardization*, a new category emerged that concerns better support for communication between stakeholders. Under *Content*, a category emerged that is about providing a summary of the technical conditions report. When there is a poor technical condition grade there is a need for better descriptions of the condition itself, but also descriptions of potential consequences if not fixed, and necessary measures to repair the flaw. Further issues concerning assessors' expertise and the quality of the assessors' work and practices were placed in *Assessment*.

4 Conceptual Model

From the themes devised from the content analyses and shown in Tables 1 and 2, we constructed the conceptual model in Fig. 8. The model shows the two themes of *Form* and *Content* for the technical condition report as what needs to be addressed concretely for producing better reports. Alongside to the right is the

Table 2. Improvement to technical condition reports: Joint categories and themes.

Joint category	Theme
Explicated legal issues	Coordination
Clarified responsibilities	Coordination
Self-declaration from seller used	Coordination
Technical value included	Coordination
Technical conditions in sales documentation	Coordination
Crosscutting expertise	Coordination
Better support for communication	Standardization
Standardized reports	Standardization
Understandable language and readability	Form
Summary	Content
Consequences and secondary damages	Content
Necessary measures	Content
Better descriptions (condition)	Content
Less general and irrelevant information	Content
Broad expertise	Assessment
TG for each building part	Assessment
Thorough investigations during inspection	Assessment

Assessment theme that calls for increasing the competence of those who produce the reports. Overarching the technical conditions report and the assessment profession is the theme of *Coordination* which calls for explicating and delineating the roles of various documents that are involved in a real estate transaction process and seeing to it that information is coordinated across those documents. Cross-cutting all of this is the theme of *Standardization*, which calls for the systemic oversight on the part of relevant regulatory and advisory bodies to provide ample support in the form of mandatory standards to ensure improvement in all the other themes.

There is, perhaps, nothing surprising in this conceptual model. On the one hand, one might say that what is called for in the model is so obvious that one might expect that all this should already be in place. What is noteworthy, though, is that this is what five groups of stakeholder have expressed more or less uniformly as necessary to improve on (albeit compiled as our conception of it) so that, clearly, this is *not* in place, as perceived by those stakeholders. It is also interesting that a category on universal design emerged, since there is legislation and standards in place to address these issues. It is not unlikely that this category signifies a lack of awareness and knowledge of universal design among those responsible for the artefacts relevant to real estate transactions. It may also reflect that there are barriers to implementing such standards.

When looking closer at the model, it becomes clear that there is, in fact, a lot to undertake in order to reach the state of affairs declared in the model. Initiatives have to be started to improve the form and content of technical conditions reports on many aspects, and this relies on educating assessors, on standardization and on adequate support in the situation of producing the report.

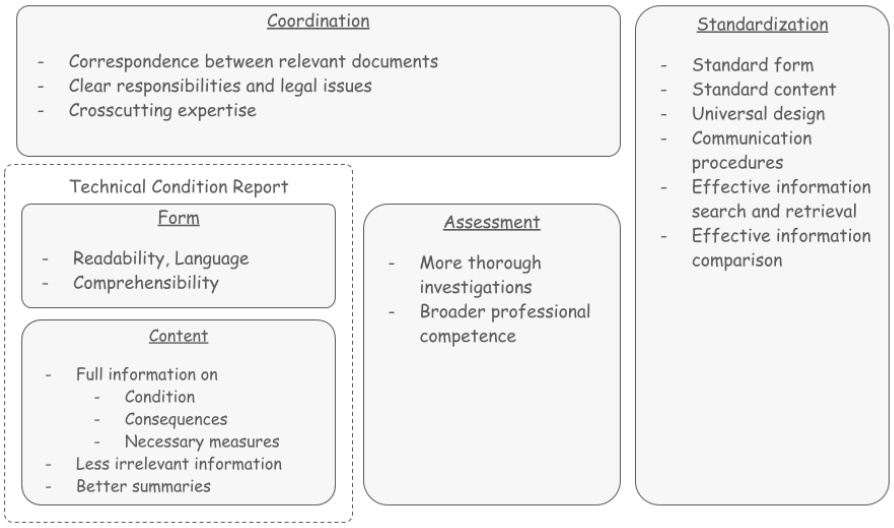

Fig. 8. Conceptual model of information products and relationships.

Standardizing form and content and ensuring universal design for reports and other relevant documents would seem to be year-long endeavours, if anything like other standardization initiatives. Add to this the development of procedural support so that stakeholders can ensure that information is coordinated across documents and placed appropriately and can maintain this consistent information picture over time.

Fortunately, in the case we are studying, standardization is under way, and new requirements have been developed with the intention that more readable technical condition reports will be produced, where consequences and necessary measures are mandatory. This means that in our case, *regulations* for several of the asked-for improvements will be in place in the near future. As is often the case, though, when new regulations are introduced, the corresponding operationalization of those regulations are not supplied. This means that stakeholders must find out ways to meet these new regulations.

All this only makes the conceptual model more relevant and the situation ripe for developing tool support for stakeholders accordingly.

5 Conclusion

The conceptual model in Fig. 8 is currently the basis for designing services for stakeholders in residential real estate transaction processes. Two focus groups have been held in which representatives for the five stakeholder groups suggested service functionality in line with the conceptual model developed in this paper. This raw service functionality material will be refined by service design and pre-

sented in a more detailed stakeholder journey map showing how stakeholders envision how, for whom and in which situations IT tool support can facilitate the production of better technical condition reports, the *in situ* education of assessors, the utilization of standardization for improving information retrieval and processing and the coordination of information across sources and responsibilities.

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