



**Anglia Ruskin  
University**

**Module Title: Major Project (Surveying)**

**Module Code: EB330992D**

**Why do defects occur on private residential properties less than 10 years old?**

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## **Abstract**

### **Background**

Previous research has shown that there are many different causes of defects occurring in private residential properties less than ten years old, these causes include; poor designs, poor workmanship, lack of inspections/quality control.

### **Aims of research**

The aims of this research were identify an up to date perspective from the professionals involved in providing the Norfolk area with new private residential properties, on where they consider defects are derived from.

### **Research methodology**

Research was conducted using a three stage method;

1. A review of literature previously conducted on the subject.
2. Quantitative questionnaires obtaining experiences from the professionals working within the sector.
3. Qualitative interviews with the head of technical standards for a new home warranty provider and a managing partner from a new home snagging company.

### **Research findings**

This research confirmed the findings of previous literature, there are many reasons for defects occurring in new residential properties. However, the main underlying issue found to be at the root of current quality issues is connected with professionals placing profit above quality.

## **Practical implications of research**

The results of this research recommend that the industry should adopt a more quality focused regime whereby quality is prioritised above profit.

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## **1.0 Introduction**

### **1.1 Nature of the problem**

Homeowners looking to purchase a new property will benefit from cheaper energy bills, new fixtures and fittings, a ten year warranty, increased fire safety and security (Shelter, 2010). Sadly, there can be issues relating to the quality of the finished property particularly with regard to the quantity of defects discovered.

Previous literature proves that there are a range of reasons for defects occurring in private residential properties less than 10 years old.

The process of building a residential property has many stages, when each contributor responsible for their particular stage carries out their role correctly, the result is a property built to the intended specification with no defects. Conversely, if a contributor fails to achieve the required result, when left undetected and adequately rectified, the completed property will contain defects.

Inevitably, defects occur on all buildings at some point during their life cycle however, these defects should be caused by general wear & tear, and materials reaching their life expectancy as opposed to human error. There are no secret tricks in producing a quality home however, new properties supposedly completed to the relevant Building Regulations / new home warranty providers' standards are continually sold to unsuspecting home buyers, even though they contain many avoidable defects (Brand New Homes, 2006).

For most people, purchasing a residential property will be the single largest investment that they make, and by expending such a large sum of money one expects to acquire a sound structure which is free from significant defects. Reductions in housing defects could be made by reconsidering the way in which buildings are designed, built and inspected.

The author finds this subject of considerable interest as he/she is employed by a company who carries out remedial works for a new home warranty provider, and encounters defects on new private residential properties daily.

## **1.2 Gaps in Research**

Many studies have been conducted on the quality of construction in general however, research focusing on house building is limited, this was highlighted by Sommerville and McCosh (2006), Sommerville (2007), and Auchterlounie (2009). Research published to date mainly concentrates on identifying defects in new build housing at hand over stage, providing numerical information on the occurrence and type of snagging/defect found.

There is no denying that defects do occur on new build housing throughout the UK, but to reduce, and eventually eradicate these defects more research needs to be conducted to find why these defects continue to occur. Studies have found that there is more than one answer to this research question, inherent problems can be found in every phase of designing and constructing a private residential home.

## **1.3 Research Aim**

Alarming amounts of home owners moving into their new homes are discovering defects/snagging items. Why are defects found within completed residential properties that have been designed, constructed and inspected by professionals? This research will highlight the experiences of where the different professionals working within the private residential house building industry feel the process is failing. Participants will also be asked for their views and opinions on the changes that could be implemented to improve the situation.

The main aim of this research is to find the most prominent causes of defects occurring in private residential properties less than 10 years old. By highlighting the main causes of defects this study can then go on to discover how these causes can be controlled, reduced and potentially eradicated.



Key questions presented to various professionals involved in the private residential property industry;

- What is the main reason for defects occurring in private residential properties less than 10 years old?
- Is there an expectation that there will be a certain number of defects / snags within a new private residential property?
- How many defects / snags would the professionals expect to find?
- Based on quality alone, would the professionals purchase a new home built in the last 10 years?
- Is the quality of new build private residential properties increasing or decreasing?
- What can be done to reduce defect occurrence in new private residential properties?

#### **1.4 Outline methodology of the research**

A review of literature relevant to residential property construction was used to discover other authors' findings on the reasons why defects occur on properties less than 10 years old. Questionnaires were sent to various professionals involved in the private residential construction industry.

Questionnaires were constructed to verify, and possibly add to, the various findings within the literature review. A third technique via structured interviews with a home warranty provider's head of technical standards and a new home snagging inspector were conducted to triangulate results.

Further details of the full methodology can be found in Methodology chapter.

#### **1.5 Dissertation Structure**

1. Introduction

2. Literature review
3. Ethics statement
4. Hypothesis
5. Methodology
6. Findings
7. Analysis
8. Conclusions and recommendations
9. References
10. C.V. and exit plan
11. Appendices

## 2.0 Literature Review

### 2.1 Research Question

Why do defects occur on private residential properties less than 10 years old?

The following list derived from Marshall *et al* (2009) identifies typical defects that can be found in poor designed, built and/or quality managed private residential properties less than 10 years old, this list is in no way exhaustive but provides a good background as to the kind of defects that can be encountered;

- Cracks in walls especially at natural lines of structural weakness, eg windows, doors junctions with extensions and bays.
- Bulging/bowing of walls.
- Rising dampness.
- Uneven ground floor slabs.
- Movement in upper floors (bounce when walked on).
- Damp penetration of roof.
- Cracking to render.
- Loose/hollow render.
- Condensation.
- Faulty heating, plumbing and electrics.
- Blockages/leaks to drainage.

Deterioration to any building is inevitable “*The structure settles down, materials swell and shrink, expand and contract: Air and waterborne chemicals and dirt attack surfaces causing discoloration and corrosion*” (Mills, 1994), during the first 10 years after a property is built there will be certain amount of maintenance required as materials meet their life expectancy. Obviously, new home warranty providers will not provide cover for defects that are considered to have occurred due to natural occurrences and/or lack of maintenance by the homeowner. This study will research into the defects that are caused by human error originating from the planning, designing and construction stages of a new private residential property.

Defects or snags have many different definitions within the private residential construction context. Definitions include;

*“A material, component or finish is defective usually when it does not meet its expected performance criteria”* (Isurv, 2010).

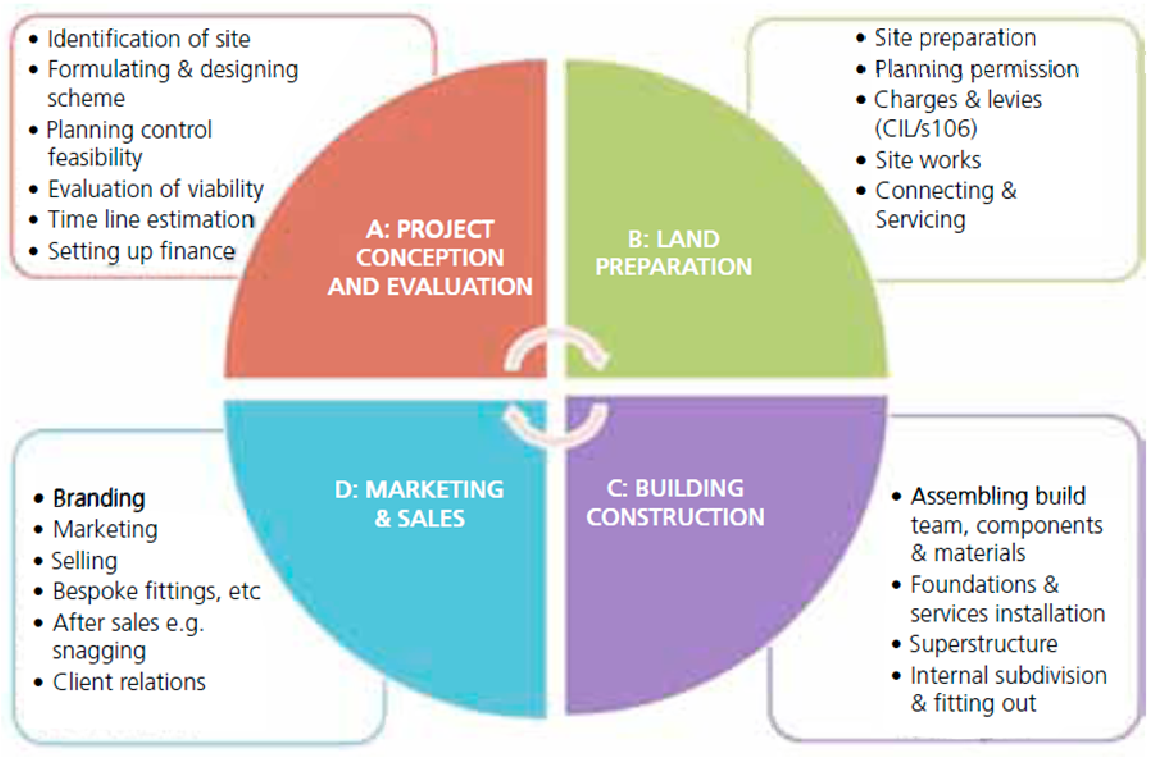
*“The nonfulfilment of intended usage requirements”* (BS 4778-1:1987, pp.7).

*“Unacceptable condition that may be in-built or the result of deterioration or damage”* (BS EN 1504-9:2008, pp.6).

There are various methods that can be implemented to avoid defects however, put in simple terms by Chudley & Green (2008, pp.28);

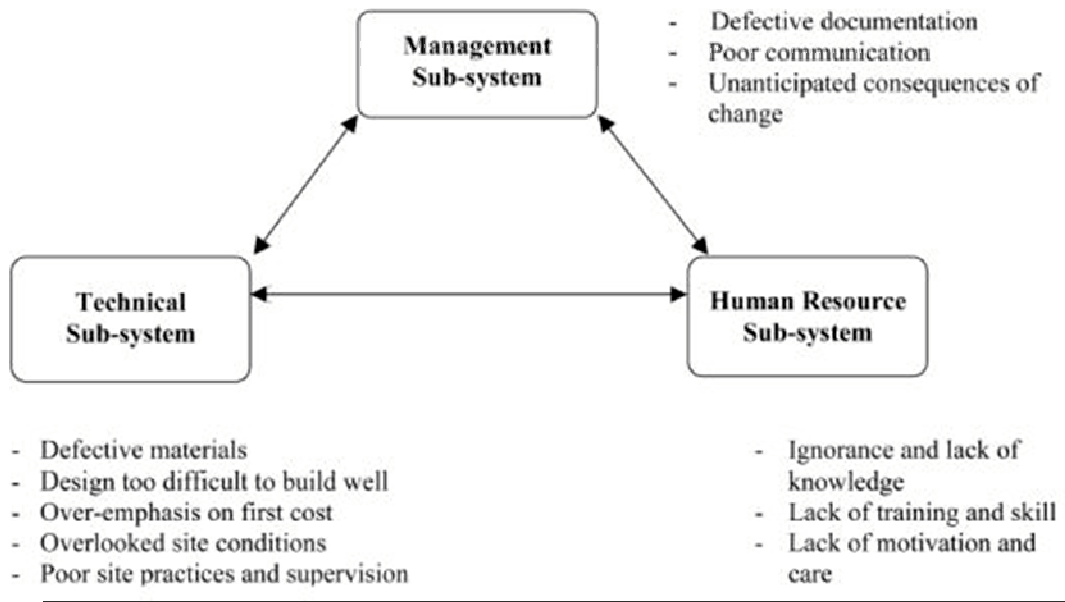
*Construction defects are avoided with the “correct application of materials produced to the recommendations of British, European and International Standards authorities, in accordance with local building regulations, by laws and the rules of building guarantee companies, i.e. National House Building Council (NHBC)”*

Figure 1 (Department for Communities and Local Government, 2010, pp.46) sets out the housebuilding process in the UK, the principal activities within each phase, from finding a suitable area of land to selling completed houses are highlighted below.



**Figure 1 – The Housebuilding Process**

Pheng and Wee (2001, pp.10) recognised that defects are caused by nature or human error, defects caused by nature are inevitable. Pheng and Wee categorized human error into three areas; management, technical and human resource, illustrated in Figure 2.



**Figure 2** – Human-error related causes of defects in a project system

The media has uncovered many instances where home owners have experienced great dissatisfaction with their new homes. Tomlinson (2004) reports of a homeowner in Scotland who carried out the usual tour prior to keys being handed over. The tour provides an opportunity for the new homeowner to become acquainted with their house and to point out any defects to the builder. At the time of this particular tour, the inexperienced homeowner was only able to find two defects. The homeowner decided it would be prudent to engage the services of a professional practice that specialises in conducting new build inspections. The professional inspection uncovered a total 77 defects, there is a chance that many of these defects would have gone unnoticed. Unfortunately, similar articles can be found in both local and national media revealing homeowners concerns regarding their new homes (Fort, 2009a; Fort, 2009b; Browne 2005a; Browne 2005b; Browne 2005c; Browne, 2006; Davy 2007).

## 2.2 Evaluation of the Need for Researching This Question

A target has been set by the Department for Communities and Local Government (2007) to construct 240,000 houses a year to meet growing demand, The Calcutt

Review (Calcutt, 2007, pp.63) advises that this high demand must not be met with housing that is to a low standard;

*“...building to a low standard, where new housing incurs additional cost because defects in design or construction have to be expensively remedied after occupation, is a false economy.”*

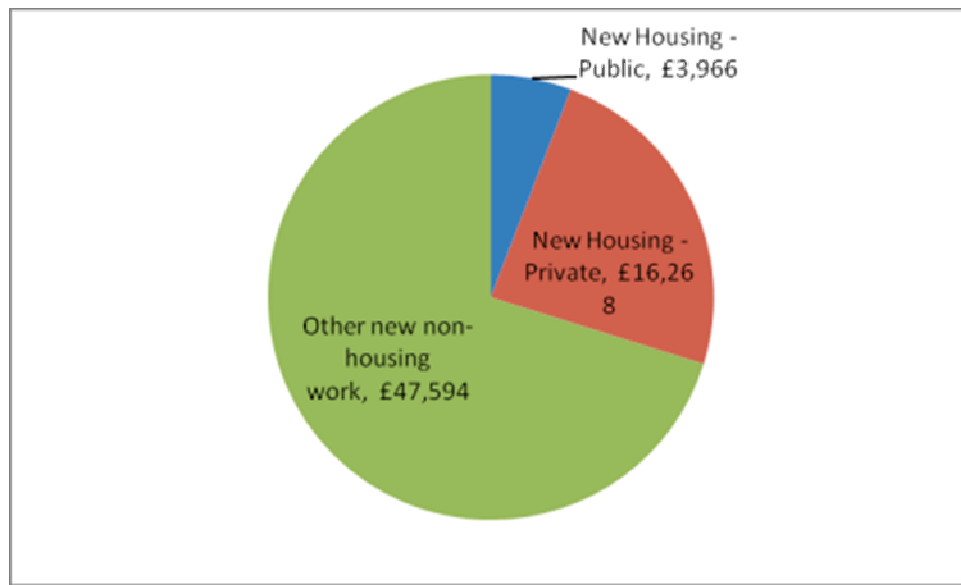
The Department for Communities and Local Government (2009) statistics on the number of net additions to England’s housing stock (Table 1) shows that speed of production is not currently in accordance with the government’s expectations. Fast tracking the process of providing additional housing may have detrimental effects on quality.

Year	Number of Dwellings
2004-05	169,480
2005-06	186,600
2006-07	199,000
2007-08	207,470

**Table 1** – Net additions to England’s housing stock.

Housing, both private and public, represents a total value of £3,923 billion or 56% of the nation’s wealth, (Office for National Statistics, 2009a) therefore it is of great importance that houses are constructed to an excellent quality which future generations will be grateful for.

The chart below, provided by The Office for National Statistics (2009b), illustrates the size of the private residential housing market in the UK. The area in red shows that private house building accounts for approximately 24% of the UK’s construction output, considering the size of the industry, there is a substantial need for research to be undertaken to assist in implementing more quality focused working techniques.



**Figure 3** – The distribution of UK new works in 2008: £ Millions

After purchasing a new private residential property, the Home Builders Federation send each new home owner the ‘New home customer satisfaction survey’ containing questions regarding their home. Reporting of defects by new home buyers have been rising steadily from 93% in 2006 to 95% in 2009 (Home Builders Federation, 2006, 2007, 2008, 2009). Results from past years’ questionnaires go on to show that there is an expectation, among new home buyers, that their brand new house will contain defects when they move into it. Why is this considered the norm, when purchasing a new car would one expect there to be snags or defects?

The National House Building Council (NHBC) provides around 80% of new home warranty and insurance cover in the UK (NHBC, 2009). This cover, known as ‘Buildmark’, provides purchasers of new homes with a 10 year warranty which covers;

1. *“Damage or defects to your home which occur during the first two years from the date of legal completion.*
2. *Damage to specified parts of your home (essentially the structural elements), in years 3 to 10.” (NHBC, 2010)*



The yearly amount of money spent by the NHBC as a result of claims against their Buildmark cover is set out in the table below;

Period	Claims Money Expended	New Homes Registered
2000/2001 (NHBC, 2001)	£24,000,000.00	No information available.
2001/2002 (NHBC, 2002)	£27,300,000.00	No information available.
2002/2003 (NHBC, 2003)	£26,900,000.00	No information available.
2003/2004 (NHBC, 2004)	£30,000,000.00	No information available.
2004/2005 (NHBC, 2005)	£35,100,000.00	193,500
2005/2006 (NHBC, 2006)	£37,300,000.00	185,000
2006/2007 (NHBC, 2007)	£36,800,000.00	181,000
2007/2008 (NHBC, 2008)	£46,400,000.00	185,000
2008/2009 (NHBC, 2009)	£59,300,000.00	81,000

**Table 2** – Money spent by the NHBC repairing defective homes.

The NHBC allow original builders/developers the opportunity to rectify any defects that are identified and reported during the ten years of the Buildmark cover. Consequently, the above amounts do not include any money spent by original builders/developers. These figures exhibit the vast sums of money spent each year remediating defects found in new private residential properties less than 10 years old.

The NHBC are not the only organisation to offer new home warranty, other organisations include Premier Guarantee and Local Authority Building Control (LABC) Home Warranty. Banks and building societies require that such warranties are in place in order to provide a mortgage to purchase a property.

Margoles & Coward (2007) collated findings from the English House Condition Survey (EHCS) and the Survey of English Housing (SEH), conducted in 2001 and 2004 respectively. The results found that issues such as cost, location and size were considered more important to home owners than the state of repair. Egan (1998) compared the house building industry to car manufacturing, there are similarities of being able to purchase a car in a particular size and cost however, the

location of a house is fixed. A new housing site offers home buyers, wanting to move to the area, with brand new homes varying in size and specification. Often, availability of homes in certain geographical areas is minimal and the appeal of a new development will be increased. With many homes being purchased prior to completion, prospecting homebuyers invest a considerable amount of faith in the professionals involved.

The process of carrying out remedial works to rectify defects i.e. snagging, provides the house builder with an opportunity to put right any contraventions to the completed house. This inconvenient task decreases customer satisfaction by causing major disruption to the home owner. The following studies illustrate that the quantity and severity of snagging items found vary from house to house.

Sommerville *et al.* (2004) collated the data from over 600 new home inspection surveys completed by Inspector Homes Ltd. It is clearly evident, unsurprisingly, that larger houses contain higher numbers of defects, this study found one five bedroom house containing a staggering 406 defects.

The research conducted by Sommerville & McCosh, (2006) on 1696 new homes in the UK, clearly identify the extent of the varying levels of defects/snags found in newly constructed houses. Five houses within their study contained over 300 defects, and the average number of snags found per property was 59.08.

Sommerville & Craig (2006), again, collated information from 2202 snagging inspections covering a four year period. The average number of snags noted had been decreasing steadily from 2002 to 2004 however, 2005 saw an increase in snags by 18.2%.

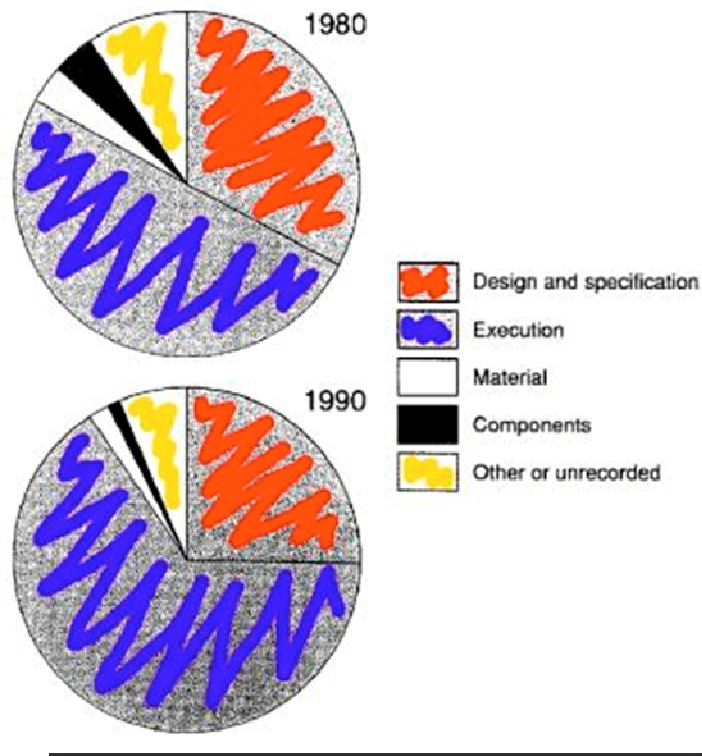
Bearing in mind that the snagging items identified within these reports were obtained by non destructive means, additional opening up works could discover further defects. One finds it rather disconcerting to take into account that homes included within snagging surveys have been inspected, and deemed fit for occupation by the house builder and warranty provider.

## 2.3 Research Already Conducted on Topic

Previous literature has discovered that there are many causes of defects in new private residential properties, rather than just one.

The Building Research Establishment (BRE) has conducted two separate studies on the quality of new build housing. This was achieved by performing site surveys on a sample of housing sites at varying stages of development. The 1982 (Bonshor and Harrison, 1982) study assessed 15 sites, of the 1313 types of fault analysed, nearly half of the faults were attributed to the on site construction process. Approximately one third of faults were attributed to design and specification. The more recent 1993 (Harrison, 1993) study assessed 18 sites, of the 976 types of fault analysed, faults attributed to the on site construction process had increased considerably. The construction process accounted for almost three quarters of faults, consequently, design and specification had decreased to approximately one quarter. The following two pie charts in figure 3 illustrate the differentiation between the two studies. The key observations made by the BRE between the two studies were;

- Faults found in the original study were still prevalent in the later study.
- More recent schemes were developed on poorer quality sites.
- Efforts to achieve appealing and distinctive housing designs by including features such as, dormer windows and porches, tend to increase defect occurrence.



**Figure 4** – Origins of defects, 1982 and 1993 studies compared (original charts altered to improve clarity) (Harrison, 1993, pp.3).

The following findings have been structured using Pheng and Wee's (2001) categories of defects caused by human error:

*Management;*

Atkinson (1999) found that improving formal communication on site was the most important factor in reducing defect occurrence. In addition, Atkinson discovered that the lesser experienced, more qualified site managers were actually associated with better performance. Atkinson's research shows that qualifications more than make up for experience, as new innovations are introduced into the residential construction industry it is extremely important that site managers keep themselves up to date by attending courses, seminars and conferences.

*Technical;*

Ong (1997) argues that pre-completion marketing decreases the incentive for home builders to construct a quality finished product. Yusof *et al.* (2010) recognises the quality issues revolving around the 'sell then build' technique used by home builders. Yusof *et al.* recommend a 'build then sell' conveyance system is used to improve home builders' motivation leading to increased quality. Auchterlounie (2009) deemed the use of end of line inspection techniques utilised by house builders to be the cause of defects being passed onto home buyers. Sommerville & McCosh (2006) identify the lack of protection available for purchases of new homes to be a real problem area in the private residential market, and more incentives need to be provided for home builders to produce defect free housing. Sommerville (2007) reemphasises the lack of protection for new home buyers by calling for a change to the legislation relating to the conveyance of new residential homes. Georgiou *et al.* (1999) discovered the lack of inspections conducted at the final critical stages prior to sub contractors leaving site requires improvement. Sealey (1987) found that 58 per cent of the defects originated from faulty design.

*Human resource;*

Williams' (2006) study on 32 snagging survey reports found internal decorations to be the most common defect, said to have been caused by lack of sufficient inspections and the use of subcontractors. Chan *et al.* (2006) research found that companies with a higher percentage of directly employed staff achieved higher scores in the Hong Kong Housing Authorities' assessment. Leishman *et al.* (2004) studies found that, again sub contracting was the main cause of defects in house building, special attention was given to the lack of communication between these sub contractors. Love *et al.* (1999) attributed the amount of defects to the poor skill level of the construction, design and management teams. The lack of competence led to a greater requirement for 'rework' to take place, i.e. performing a task more than once in order to achieved a desired result. Under investment in training construction operatives, increased use of contracted labour as opposed to direct labour and procurement based on the lowest tender were all found to detract from quality (Ross *et al.* 2006). Ross (2008) reveals defects occur when designers choose aesthetics

over performance, and when weather adversely affects materials due to inadequate storage and protection.

Clarke and Herrmann (2007) found a shortage in labour particularly in trades such as carpentry, bricklaying and plastering. Firms mainly rely on recruiting operatives from other companies as opposed to training operatives themselves. The lack of skilled labour available leaves home builders little option, in the short term, but to employ contractors who are of an undesirable quality.

## **2.4 Reliability/Validity of Results**

The inconclusive nature of defect origin in the private house building industry appears to be a direct result of the participants involved in previous studies. For example, if you were to ask an architect why defects occur, he/she would be very unlikely to say that their design is at fault. Similarly, on site tradesman would be unlikely to blame their workmanship.

Any defects and errors in processes such as the initial site investigation, or the drawings and specification are invariably not identified until construction commences or once construction is complete. As contractors are responsible for constructing the end product, it is easy to associate any defects found once the building is complete, with the operatives who carried out the works.

Many problems found at completion can be a collaboration of many contributors failing to perform their task correctly. To locate the responsible participant for each specific defect is almost impossible. The literature review has found that when researchers delve deep enough they are able to find an extremely wide array of causes for defects occurring however, could there be a common theme if these causes are traced back to their source?

### 3.0 Ethics Statement

In order to ascertain the reasons why defects occur on private residential properties less than 10 years old, in addition to reviewing literature, human participation will be required. Questionnaires and interviews will be conducted involving various professionals including;

- Architects / Designers
- Building Control Officers
- Home building warranty provider inspectors / investigators
- Site Managers
- Building surveyors
- Quantity Surveyors
- Structural Engineers
- Building Services Engineers
- Clerk of Works / Building Quality Officers or similar

To maintain confidentiality, no personal/company details shall be requested from the candidates. It will be made clear from the outset that if any participant and/or the company they are representing would like to remain anonymous when undertaking questionnaires/interviews, their confidentiality will be respected and will in no way be disclosed at any point. Interviews shall be recorded using a digital voice recording device; recordings will be transferred to a computer and deleted from the recorder. Completed questionnaires will be stored in a lockable cabinet until required. Information obtained during the study shall be transferred to a statistical analysis software program carefully and meticulously to ensure data is accurately processed. Information will be stored electronically on a standalone computer, within an encrypted folder.

Telephone calls/emails shall be made/sent to companies'/practices' offices to initial consent for questionnaires to be sent and/or for interviews to be organised. Participant Information Sheets (template provided by Anglia Ruskin University) will

be sent to prospecting candidates prior to any questionnaires taking place. The form will also be accompanied by Participant Consent Forms (template provided by Anglia Ruskin University) when interviews are required. These documents will provide candidates with the following information;

- Participation is completely voluntary, explicit consent must be granted.
- Information provided will be safeguarded and kept confidential.
- Candidates are free to ask questions or withdraw from the study at any time.
- Individuals will be made aware of what is trying to be achieved during the study and the potential benefits of participating.
- Prospecting candidates will not be pressurised to participate, or made to feel guilty for not participating.
- Information that is commercially sensitive will not be used within the study and will be destroyed.
- Only information relevant to this study will be obtained.

Information obtained will not be shared or discussed with persons who are not directly involved with the study, and Information will be solely used for research purposes for this project. By applying the aforementioned will alleviate the risk of physical, mental, legal, financial, commercial risk and reputation being affected.

The research will highlight the areas where different professionals feel the new build residential housing market is failing. Views and opinions will also be sought on the methods that could be implemented to improve the situation.

Information obtained within this study will be dealt with in accordance with the six principles set out in the Economic and Social Research Council's (ESRC) Research Ethics Framework (2005);

- *“Research should be designed, reviewed and undertaken to ensure integrity and quality*
- *Research staff and subjects must be informed fully about the purpose, methods and intended possible uses of the research, what their participation*



*in the research entails and what risks, if any, are involved. Some variation is allowed in very specific and exceptional research contexts for which detailed guidance is provided in the policy Guidelines*

- *The confidentiality of information supplied by research subjects and the anonymity of respondents must be respected*
- *Research participants must participate in a voluntary way, free from any coercion*
- *Harm to research participants must be avoided*
- *The independence of research must be clear, and any conflicts of interest or partiality must be explicit”*

The eight principles of the Data Protection Act 1998 (Information Commissioner’s Office, 2008) will also be considered when obtaining and processing information, to ensure data is;

- *“Fairly and lawfully processed*
- *Processed for limited purposes*
- *Adequate, relevant and not excessive*
- *Accurate and up to date*
- *Not kept for longer than is necessary*
- *Processed in line with your rights*
- *Secure*
- *Not transferred to other countries without adequate protection”*

Once the study has been submitted to Anglia Ruskin University for assessment and returned, all data both electronic and hard copy, will be destroyed. Hard copies will be shredded and electronically stored data will be deleted, and the desktop Recycle Bin emptied immediately after.

## 4.0 Hypothesis

Defects in private residential property are caused by poor design, poor workmanship and quality management, but they can be avoided.

### 4.1 Sub Hypothesis

The literature review has recognised the following causes of defects in private residential property construction;

- Poor workmanship
- Lack of inspections
- Use of subcontractors
- Poor / difficult designs
- Lack of skilled labour / training schemes available
- Use of pre completion marketing
- Lack of / poor communication on site

Defects in new housing can be reduced by implementing the following initiatives;

1. Provide designers and developers with more incentives to improve quality.
2. Increase the number of inspections made by building control officers and new home warranty inspectors.
3. Limiting the use of sub contractors.
4. Introducing more training schemes to increase existing and future contributors' skills.
5. Reduce the amount of homes a builder can sell prior to completion.
6. Use of project team partnering whereby all contributors work in a team to produce a quality end product.
7. Selecting a good project team who all have the same vision of producing a quality end product.

## 5.0 Research Methodology

### Stage 1: Literature Review

Prior to compiling a questionnaire, a comprehensive review of the relevant literature was undertaken to gain previous results on where the new private residential property construction industry has been failing.

### Stage 2: Pilot Study

The quantitative data collection was performed using an electronic questionnaire however, an initial pilot study was conducted by sending the questionnaire to a sample of 10 professionals and followed up by interviews.

### Stage 3: Main Survey Questionnaire

The feedback from the pilot study assisted in finalising the questionnaire layout and format.

A wide range of professionals were included in the study to ensure that many points of view were obtained thus providing unbiased results. The sample of professionals selected for this study operate in the Norfolk area. Professionals included were as follows;

- Architects / Designers
- Building Control Officers
- Home building warranty provider inspectors / investigators
- Site Managers
- Building surveyors
- Quantity Surveyors
- Structural Engineers
- Building Services Engineers
- Clerk of Works / Building Quality Officers or similar

The questions asked were closed questions, the options of which were devised using the findings from the literature review. Questions such as 2, 6 and 7 had an open element that allowed participants to explain the reasons behind their answers. The questionnaire was kept relatively short to ensure participants' time spent completing the questionnaire was minimal, thus decreasing inconvenience.

Participants were sent an email with details of the study, including the participant information sheet and an editable version of the questionnaire in Portable Document Format (PDF). Participants who agreed to take part were given options as to choose how they preferred to complete the questionnaire, the options were as follows;

1. Complete the questionnaire by the editable PDF file, saving their responses and emailing it back to the author.
2. Printing out the questionnaire, completing by hand and returning by post, fax or email to the author.
3. Completing the questionnaire online by following a link to the survey website [www.surveymonkey.com](http://www.surveymonkey.com).

#### Stage 4: Analysing the Questionnaire

Analysis of the questionnaire was conducted in two parts:

Part 1;

Responses were collated to identify the most occurring answers and to highlight any new responses that were not found during the literature review. Responses were further analysed to ascertain if certain professions provided similar answers.

Part 2;

The most prominent findings were then analysed further by conducting qualitative interviews with a new home warranty provider's head of technical standards and a new home snagging inspector. The qualitative interviews were semi-structured interview containing open-ended questions. These questions allowed participants to provide with the flexibility to answer questions completely openly.

The reviewing of previous literature, obtaining quantitative data via questionnaires and conducting qualitative interviews allows triangulation to take place. As a result of this three stage approach, the authenticity of the data obtained should be of high standard.

#### Stage 5: Writing the Research Report

This stage involves writing up the content of the dissertation, covering the chapters as set out on the contents page.

## 6.0 Findings

As discussed in the methodology, data collection consisted of two parts, first part quantitative questionnaires and second part qualitative interviews. Firstly, the quantitative questionnaires shall be considered.

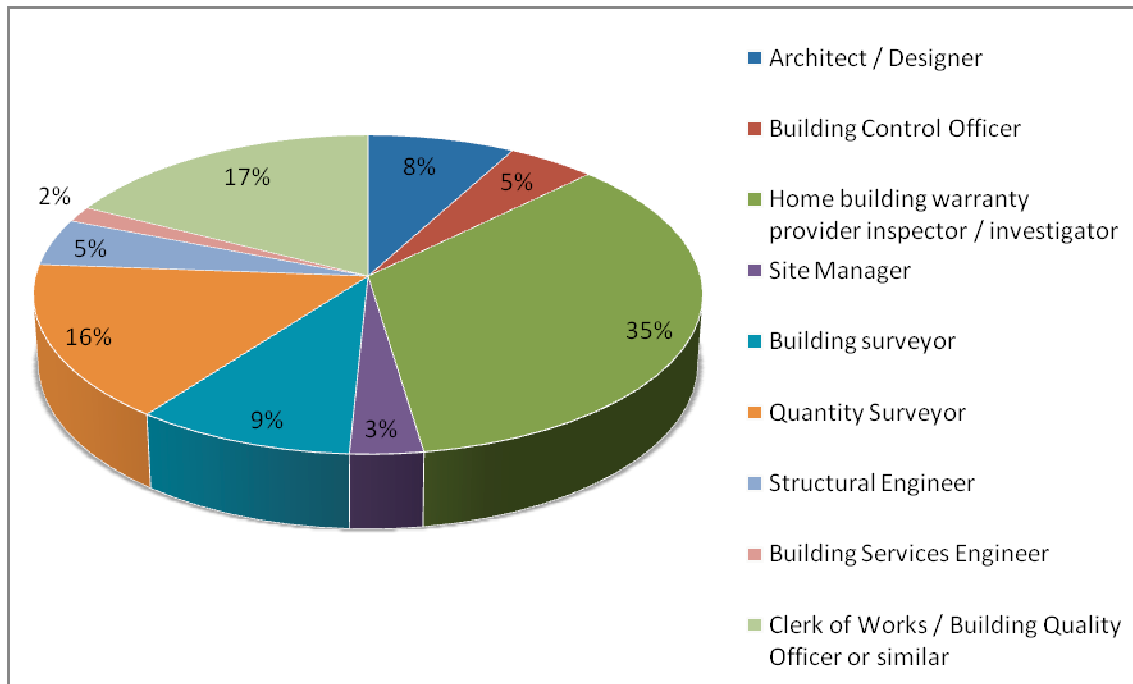
### 6.1 Questionnaires

Of the 347 questionnaires which were emailed, a total of 62 responses were gathered, therefore achieving a response rate of 17.87%. Full responses to questions 2, 6 and 7 can be found in appendix C of this report.

#### **Question 1:** What is your job title?

This was a simple question which was used to gain a basis of the type of professionals who participated in the study consequently, the perspectives of each professional can be cross referenced and analysed accordingly.

#### **Results:**

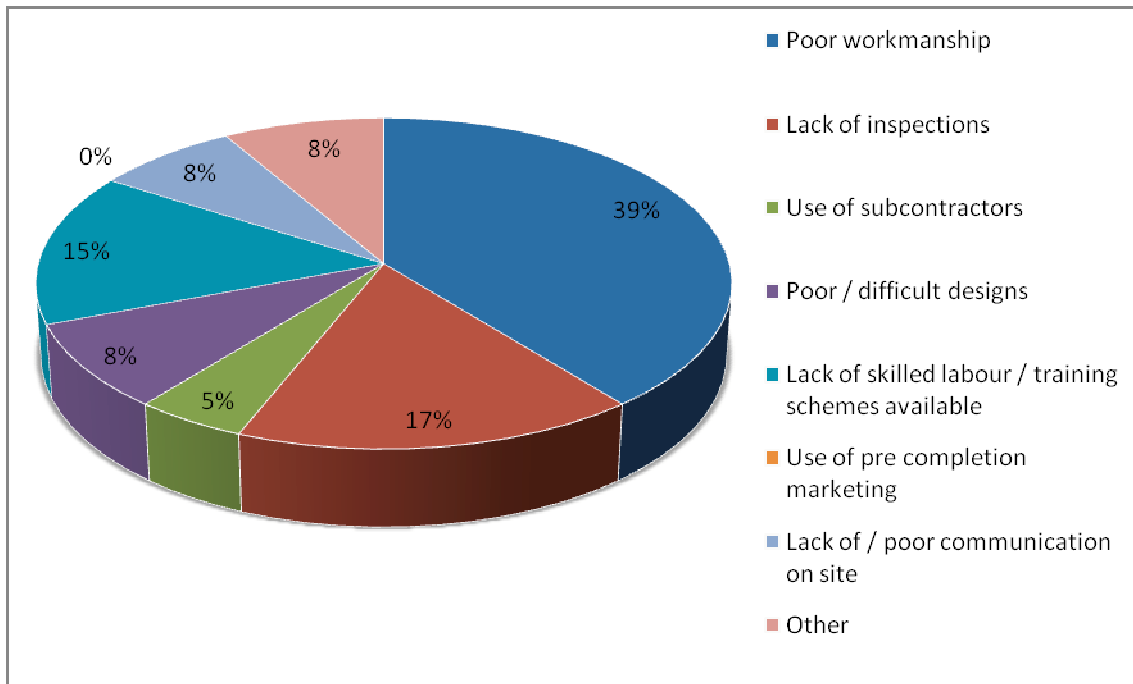


**Comments:**

Response rates varied from each company/individual that were selected to participate. Home building warranty provider inspector / investigator (35%), Quantity Surveyors (16%), and Clerk of Works / Building Quality Officer or similar (17%) were the three main contributors to the study.

**Question 2:** In your professional opinion, what is the main reason for defects occurring in private residential properties less than 10 years old? This question is related to the main topic of this dissertation. Respondents were given the eight options on where they feel the industry is making mistakes, the eighth option, 'Other', allowed respondents to add another reason which was not listed. Respondents were asked to make additional comments to further explain their choice of answer.

**Results:**



**Comments:**

39% of professionals agreed that poor workmanship was found to be the most common cause associated with defect occurrence. Most respondents who selected poor workmanship continue on to explain that the poor workmanship was generally a result of subcontractors conducting the work;

*“99.9% of defects are down to poor workmanship however these are usually caused by sub contractors who are held to a very tight cost control and will cut corners if they can.”*

*“Subcontractors are on a price, hence rush jobs & cut corners / reduce details etc.”*

50% of the option ‘Lack of inspections’ were selected by Clerk of Works / Building Quality Officer or similar, sample justifications for their decision are provided below;

*“A big percentage of speculative housing is covered by NHBC inspections and as with Building Control, only statutory inspections are carried out. Quality*



*control needs to be the key factor and inspection carried out as the project progresses.”*

*“as a clerk of works I may be biased about our role in the construction process. firstly clerk of works are a deterrent against poor workmanship, as disciplines involved know that working practices will be checked at regular intervals. He will check everything from start to finish materials used /building regulations adhered to. Then he will complete a detailed defects list. identifying possible future problems. In-depth reports to architects. reports on weather conditions, labour on site, health and safety practice etc. I find it difficult to comprehend how houses can be built in this country without a clerk of works”*

The third most popular selection ‘Lack of skilled labour / training schemes available’ provided the following explanations;

*“It is a fact that the majority of labour employed on sites at present are not formally trained. Apprenticeships within the industry are at the lowest point I have known in my 44years of experience. Until this very basic problem is remedied, the standard of workmanship will continue to deteriorate.”*

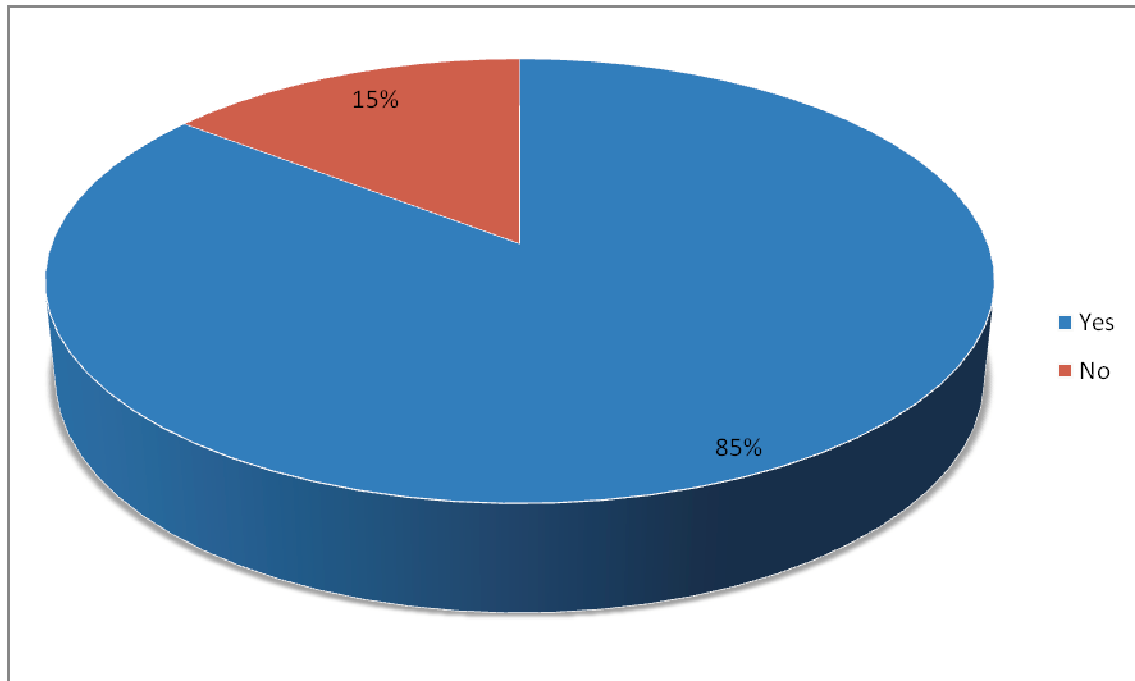
*“Most site labour is skilled but where problems occur it is down to poor workmanship caused by lack of knowledge or training.”*

Of the 8% of respondents who selected the ‘Other’ option, the explanations provided were;

- Homes are built too quickly leading to corners being cut.
- Homes are being constructed down to meet a particular price rather than up to a high specification.

**Question 3:** If you purchased a new residential property, would you expect there to be a certain number of defects / snags within the property? This question was aimed to determine respondents' awareness of defects in new housing.

**Results:**

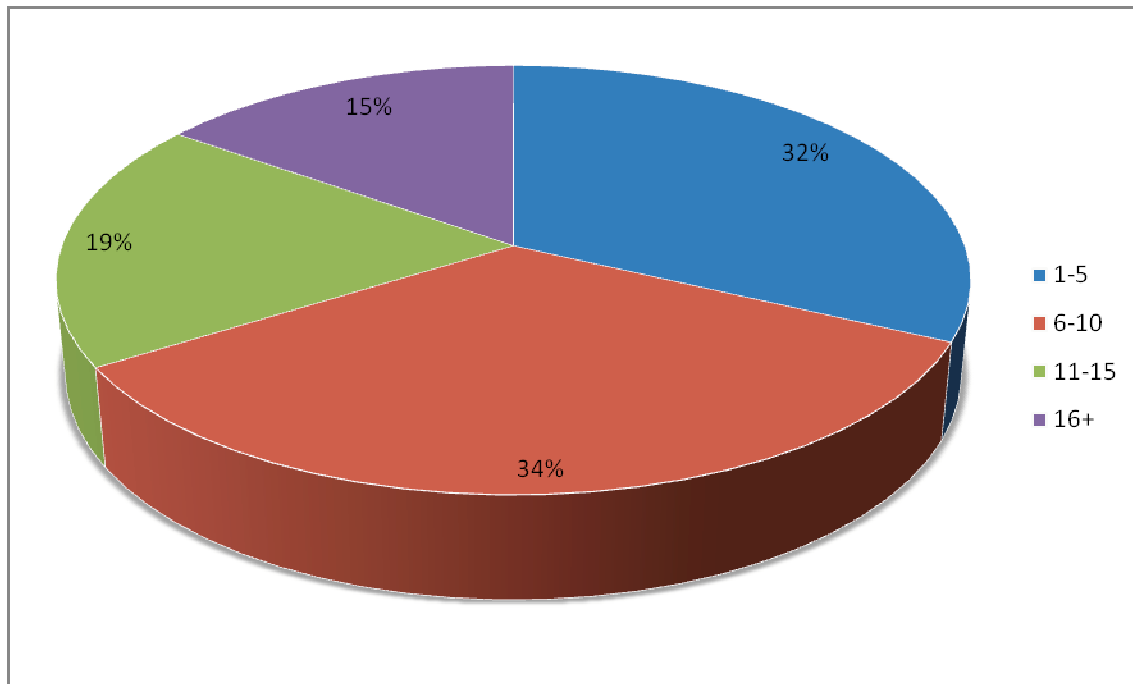


**Comments:**

15% of respondents were confident that if they were to purchase a new home any defects or snags found would have identified and remedied prior to purchase, while the remaining respondents confirmed the expectation within the industry that new homes will contain defects.

**Question 4:** If you answered yes to the previous question, please indicate how many defects / snags you would expect to find? This question was used to quantify the amount of defects each professional would expect to find in new home.

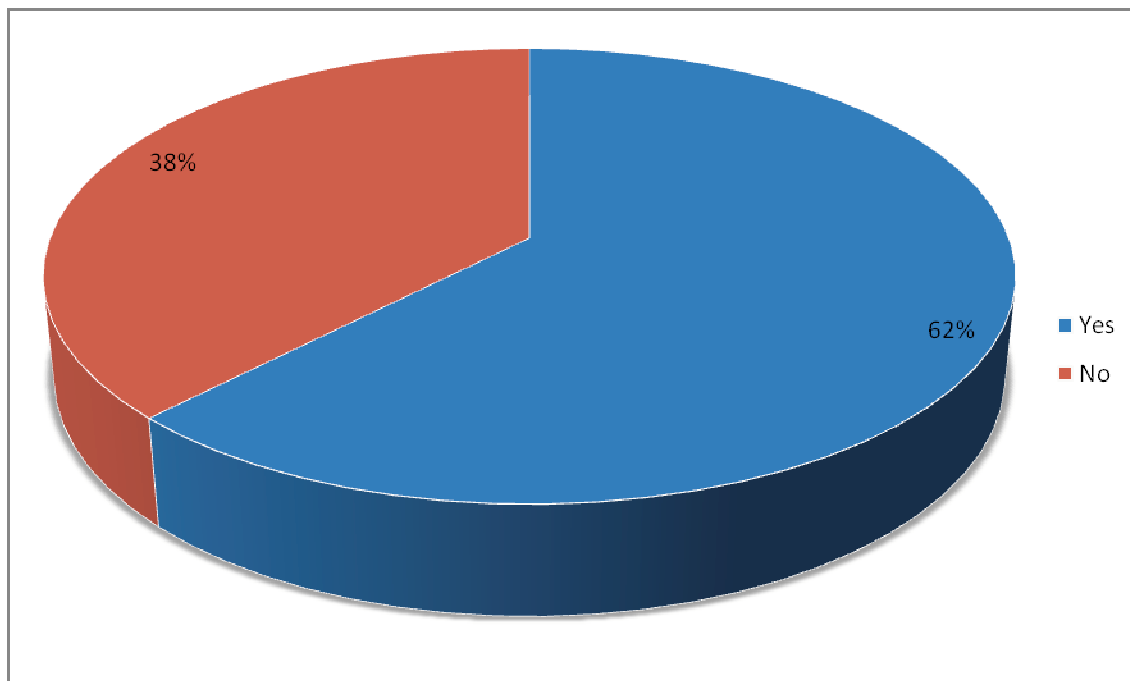
**Results:**



**Comments:** 66% respondents would expect there to be ten or less defects/snags if they were to purchase a new property. The majority of responses (62.5%) of the sixteen defects or more category were selected by Clerk of Works / Building Quality Officers or similar.

**Question 5:** Based on quality alone, would you purchase a new home built in the last 10 years? This question aimed to measure the level of confidence the various professionals working within the private residential property market have of the final product which they are producing.

**Results:**

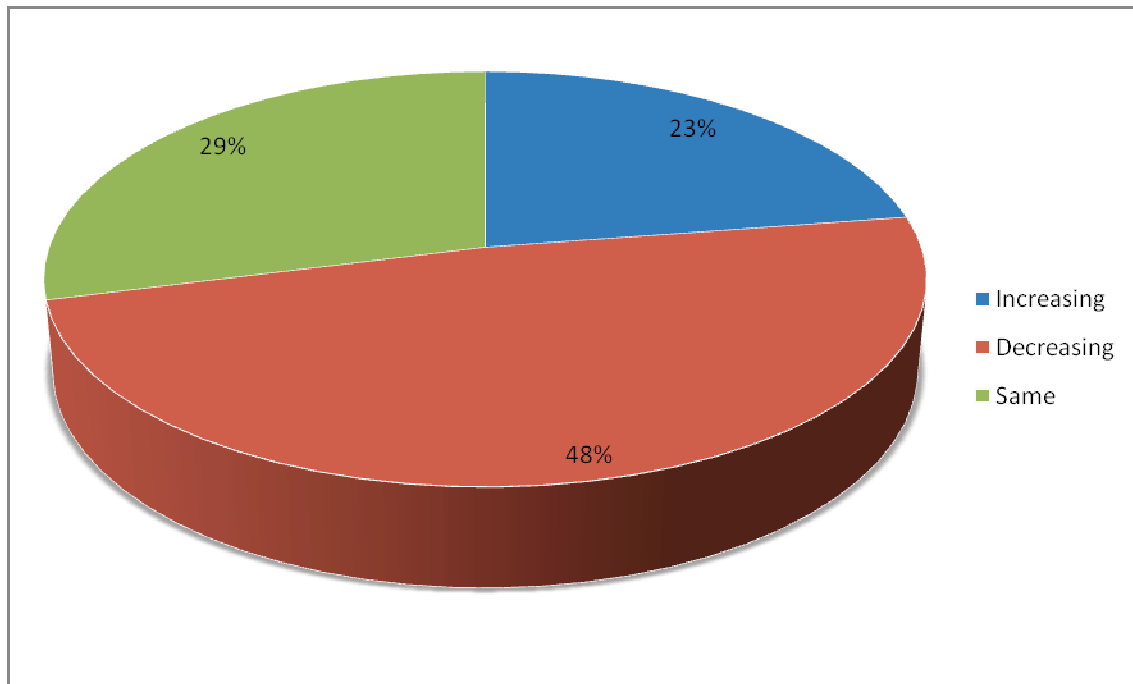


**Comments:**

Home building warranty provider inspector / investigator's were the greatest contributors in answering yes to this question, 68.2% would purchase, based on quality alone, a new home built in the last ten years.

**Question 6:** In your professional opinion, is the quality of new build private residential properties increasing or decreasing? This question was used to ascertain if professionals believe the quality of work produced by their industry is rising or falling.

**Results:**



**Comments:**

Following on from the last question, less than one quarter of respondents agreed that quality of homes were increasing. Nearly one half agreed that the quality of new homes were decreasing. One view of a respondent who believes the quality of new homes was decreasing;

*“The standard of workmanship and training is nearly non-existent. Build for the cheapest price, using the poorest materials but sell for the maximum profit possible. The builders are also not accountable for the poor quality of their homes.”*

Another respondent added;

*“Lessons from previous defects are not being learnt and eliminated.”*

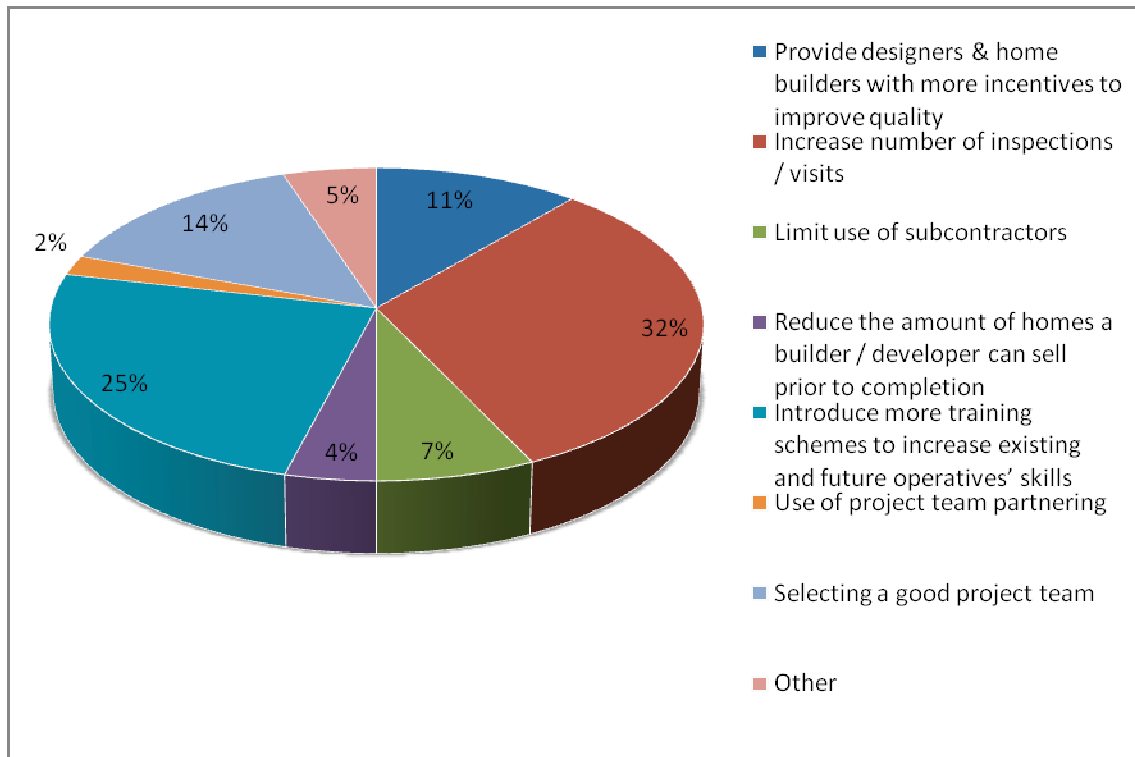
Respondents who believe the quality of new homes is increasing, provided the following explanations;

*“There are a lot of pressures on Builders to improve their product, both from consumers, Consumer bodies, government and NHBC. I have been involved in the house building industry for 30+ years and can happily say that there has been a mark improvement in quality.”*

*“Building regulations are becoming more stringent / end users have higher expectations / Developers and builders are beginning to realise that quality of the finished product is important to securing the sale of a property.”*

**Question 7:** In your professional opinion, which one of the following options would have the greatest effect on reducing defect occurrence in new private residential properties? This question was designed to gain the views and opinions on where the industry feels the greatest improvements could be made.

**Results:**



**Comments:**

Question 2 proved that poor workmanship was found to be main cause of defects occurring in new homes, the consensus of opinion in this question has shown that increasing the number of inspections would have greatest effects on reducing defects. 57% of professionals in the industry believe that the majority of defects would be alleviated by increasing the number of inspections and introducing more training schemes, this was particularly epitomised by the following statement

*“The industry must hold it's self responsible for not providing adequate skills training, not 6 month schemes but long term apprenticeships where people take pride in their trade and are trained not to produce poor workmanship. All forms of supervision need to be increased. A site cannot be run by one man sitting in an office as a manager.”*

Of the 32% of respondents who selected increase number of inspections / visits, professionals provided the following rationalisations;

*“Most problems of work could be easily solved if more inspections / supervision were carried out at the time of construction. What gets seen gets done.”*

*“Builders are expected to build the homes correctly with minimum inspections. They cannot be trusted to do this. Inspection should increase and the builders should pay for them out of their profits.”*

Respondents who selected the 'Other' option in this question supplied the following reasons;

*“The current warranty of 2 years for all defects should be extended to say 3 years, as the remainder of the 10 year warranty only covers major items such as structural defects”*

*“Greater programming time for individual elements would reduce the risks along with enabling greater time and consideration to be given to proper*

*planning of works prior to commencing on site and prior to each element. Also, if this was allowed for, then external influences such as inclement weather would present less problems as there would be an increase in programme float along with a decrease in costs being incurred by all parties for perceived overrun and defective work making good.”*

## **6.2 Interviews**

The two qualitative interviews shall now be considered,

### **Interview 1: Mr Peter Crane – Head of NHBC Standards**

The NHBC Standards are set of technical, design, material and workmanship requirements which any property registered with the NHBC must adhere to. Peter Crane is in charge of constantly evaluating the standards in order to maintain their effectiveness.

The full meeting agenda and minutes can be found in Appendix D of this report.

**Question 1:** NHBC and the house building industry; progress and future commitments?

**Answer:** Mr Crane stated that the NHBC’s main strapline is *“raising standards to protect homeowner”*. The NHBC feel that are more than just an insurance company and “want the homeowner to get a better product”. Annually, Mr Crane receives details on claims figures, these figures are analysed to see if there are trends in defects occurring in properties. The higher the amount of defects that are found in properties will cost the NHBC more money to rectify, therefore it is in the interest of the NHBC to be proactive and make changes to the standards or inspection regimes. The most important by product of decreasing defect occurrence that the homebuyers will be receiving a higher quality end home.



**Question 2:** How does the number of claims and complaints affect contractors' premium for registering a new plot?

**Answer:** Registered builders are on a premium rating scheme, ratings range from A1-D4. A1 builders register a high number of properties with the NHBC and have a low claims record, consequently, the premium they pay is much lower than a D4 builder who has not registered any plots or has a high claims record. This premium rating scheme is calculated by accumulating the amount of money the NHBC has had to spend on remediating defects on registered properties. However, the NHBC give the original builder the opportunity to put right the defects themselves, the builder would have to carry out the repairs at their own expense but their premium would not increase. Mr Crane did state that builders are sometimes removed from the list and these builders could then go and register with another warranty provider.

**Question 3:** NHBC Quality Management Services, is this service utilized by many house builders, and what are the benefits?

**Answer:** Mr Crane stated that this service had been popular in the past but due to the recession builders have had to reduce their outgoings and the statutory requirements take priority, while additional services and training are reduced.

**Question 4:** Why do defects occur on private residential properties less than 10 years old?

**Answer:** Mr Crane responded that defects associated with a properties substructure (below the ground – foundations) are generally associated with the design and defects found in the superstructure (above the ground – brickwork and roofing) are generally associated with poor workmanship. Mr Crane stated that the NHBC “*are not a clerk of works*” however, the NHBC carry out key stage inspections at each individual plot, and any problems are reported in the site record book.

**Question 5:** What can be done by the NHBC to reduce defects from the house building industry?

**Answer:** The NHBC have a risk management process to evaluate each site application, proposals are checked to confirm risks associated with a proposed development. If the NHBC deem the development to be of a high risk, the NHBC will not offer a warranty to the developer, the developer has the option of revising their proposal or approaching another warranty provider.

Mr Crane declared that the NHBC inspectors formerly covered a particular area and any property which was built in this area would fall within their remit. The NHBC have revised this so that inspectors inspect properties that they are familiar with, the same inspector will not be expected to inspect both a multi storey tower block and two storey timber framed house.

The annual claims figures illustrate where money is being spent by the NHBC on carrying out remedial works, the NHBC have recently made some changes to Chapter 1.2 – A consistent approach to finishes of the NHBC standards. Prior to these changes it was difficult for inspectors to report problems with finishes in properties. As stated in question 1, high frequency defects are fully investigated to see if changes can be made to the standards or inspection regimes.

The NHBC have considered offering a service to builders whereby, the NHBC will fully inspect a property two weeks before handover and provide a snagging list. The demand for this service was low, mainly due to cost, thus the service was never launched.

Mr Crane re-emphasised that salient point the NHBC strive to *“limit the amount of defects to limit claims”*.

**Interview 2:** Mr Martyn Maxwell – Managing Partner Brickkickers New Home Inspections

Martyn Maxwell is a managing partner of Brickkickers, Brickkickers provide inspections to discover defects/snags in new private residential properties, a report is

generated which is passed on to the original developer and/or warranty provider. There are currently a number of new home inspection companies operating in the UK working on behalf of new homeowners, and sometimes developers to assist in identifying failings in new homes.

The full meeting agenda and minutes can be found in Appendix E of this report.

**Question 1:** Do you think there is an expectation that there will be defects/snags when a home buyer purchases a new build property? This question was used to compare Mr Maxwell's opinion with the responses to question 3 of the questionnaire.

**Answer:** Mr Maxwell stated that there didn't used be an expectation amongst home buyers that their new home would contain any defects however; he explained that the media has raised the awareness of defects/snags in new homes.

**Question 2:** In your experience, what are the main causes of the defects/snags you encounter when conducting new home inspections? This question was used to compare Mr Maxwell's experiences with the responses to question 2 of the questionnaire.

**Answer:** The speed in which properties are built and the lack of quality control and inspections were given as the main causes.

**Question 3:** On average, how many defects/snags do you encounter on a new home inspection? This question was used to validate the findings in the literature review.

**Answer:** Brickkickers generally discover, on average, around 160 defects/snags in a new private residential property.

**Question 4:** In your professional opinion, is the quality of new build private residential properties increasing or decreasing? This question was used to compare Mr Maxwell's opinion with the responses to question 6 of the questionnaire.

**Answer:** Mr Maxwell stated that he thought the quality was improving however, the recession has resulted in quality becoming worse. Mr Maxwell explained “*budgets are being slashed, ...contractors are asked to cut prices but still undertake same works, ...something has to give and its usually quality*”.

**Question 5:** As a company, how many new home inspections do Brickkickers conduct on average each year? This question was aimed to demonstrate the demand for new home snagging companies in the UK.

**Answer:** Mr Maxwell stated that Brickkickers undertake around 1500 inspections per year, this equates to around 28 inspections per week.

**Question 6:** Based on quality alone, would you purchase a new home built in the last 10 years? This question was used to determine if an inspector of new homes would purchase a property themselves.

**Answer:** Mr Maxwell declared that he had actually purchased a new home and would buy another, he did warn that as houses are not covered by the Sale of Goods Act 1984, home buyers should ensure defects are recognised as soon as possible.

**Question 7:** What would have the greatest effect on reducing defect/snag occurrence in new private residential properties?

**Answer:** Mr Maxwell offered four methods of reducing defect occurrence in new homes;

1. *“Better management.*
2. *A person dedicated to quality, inspecting all properties on site.*
3. *Less contracting and more retained staff.*
4. *A retention system would have the greatest effect on builders, money held back for a year in lieu of problems.”*

## 7.0 Analysis

Considering each question of the questionnaire in turn, and comparing results with the two interviews and previous findings;

### **In your professional opinion, what is the main reason for defects occurring in private residential properties less than 10 years old?**

The results of the question proved the findings of the literature review, that there is not one single point of fault for defects occurring in new properties less than ten years old.

The hypothesis for this dissertation stated that design would be one of the three main causes in this question however, this is likely to have been caused by the participants who were involved in the study. Had more site managers been involved in the questionnaire a more balanced result would have been achieved. Mr Crane mentioned both poor design and poor workmanship in response to this answer, Mr Crane was confident that items inspected during the NHBC key stage inspections would be in accordance with NHBC Standards. Mr Maxwell attributed defect occurrence to the speed at which properties are built and inspected.

### **If you purchased a new residential property, would you expect there to be a certain number of defects / snags within the property?**

This question found that 85% of professionals would expect to find defect/snags within a new property. The results from the 2009 Home Builders Federation survey (2009) found that 95% of new homeowners found defects in their new houses. This direct comparison shows that the situation is actually worse than the professionals working within it perceive.

### **If you answered yes to the previous question, please indicate how many defects / snags you would expect to find?**

Responses for this question were similar to the results found in the 2009 Home Builders Federation Survey (2009); the main variation was in the 16 defects or more category. 15% of respondents in this study expected there to be 16 defects or more, while in reality 24% of homeowners experience 16 defects or more.

The average number of 160 defects Mr Maxwell finds during his snagging inspections could be ascribed to his experience and expertise in finding defects. Another reason for this high number of defects could be that homebuyers only engage the services of a snagging company when they feel their property is of a particularly low quality.

**Based on quality alone, would you purchase a new home built in the last 10 years?**

The results of this question show the lack of confidence of the professionals working within the private residential property industry have in the homes they are producing. However, it does show that there is an awareness that problems with quality do exist.

**In your professional opinion, is the quality of new build private residential properties increasing or decreasing?**

Mr Maxwell stated that the recession has had an adverse effect on quality. In addition, Mr Crane said that demand for the NHBC quality management service had fallen due to cost cutting measures by developers/builders. The majority of respondents in the survey agreed that quality, in general, is decreasing. It is worth noting that the results may be tainted by the current economic climate.

**In your professional opinion, which one of the following options would have the greatest effect on reducing defect occurrence in new private residential properties?**

Mr Crane demonstrated that it is in the interest of the NHBC to reduce the amount of defects in new private residential properties. A lower amount of claims against the NHBC in years 3-10 results in a lower expenditure in paying for remedial works to be undertaken. This becomes even more important when developers/builders have gone bust and no longer operate. Changing inspection regimes and increasing training were the two primary responses to this question. Mr Maxwell's responses were very much in line with what was found in the further explanations to this question.

## **8.0 Conclusions and recommendations**

### **8.1 Dissertation aim**

The aim of this dissertation was to determine the main causes of defect occurrence in new private residential properties less than ten years old. Once these causes had been identified, views and opinions were obtained to create potential systems that would assist in reducing defect occurrence in new residential property construction.

### **8.2 Comments on the research objectives**

There is a common agreement amongst the professionals working in the industry that defects originate when parties involved in the home building industry concentrate on obtaining the most profit, instead of achieving high quality. This notion obviously isn't exclusive to the home building industry, invariably when any process is fast tracked, the quality of this process decreases. It is understandable that every company has to make a profit in order to continue operating however, it should not be the case that companies can earn more money by producing low quality products. The quality of the housing built during the recent recession, when the pursuit of profit is at its highest, will be experienced in years to come.

Contractors can achieve larger profit margins by reducing the amount of time they spend completing their particular task, for example if a roofing contractor had originally planned to install a roof in five days and then manages to complete the work in four days. The day which was saved results in the contractor earning more profit, this profit can be significant when projected over the course of an entire housing estate. Invariably, increasing the speed in which a task is performed causes the process to become streamlined, this research has proved that there have been many instances where either a design has been too hastily produced and/or the property has been constructed too quickly. Not enough inspections are being undertaken and often when inspections are made there is not enough time to rectify the problems, and therefore faults are being covered up by subsequent operatives.



In an ideal situation, the site manager/quality control officer would have sufficient time to properly investigate the reasons as to why a particular defect has transpired. Correct preventative action can be taken, whether that is liaising with the design team to revise the designs or by engaging the services of more competent contractors who have the expertise to carry out the works.

### **8.3 Comments on the research hypothesis**

This investigation proves that defects in new private residential properties are a consequence of poor design, poor workmanship and quality management. However, the literature review and subsequent research proved that there are many other factors that affect quality. There is an underlying theme that the mission to acquire the most profit from each task is decreasing the overall quality of a project. Currently there do not appear to be many motivators available to developers/builders to improve their quality.

### **8.4 Personal recommendations**

The Construction (Design and Management) (CDM) Regulations 2007 pose legal requirements on the parties involved in construction projects. The main aim of these regulations are to improve health and safety by considering the way in which buildings are designed, built and managed. CDM coordinators are involved from the very outset of a project to ensure design works will be safely constructed and maintained. Why can't similar regulations be imposed with improving quality as the main focus? Currently, there are developers/builders who consider quality as high priority in their business unfortunately, quality can be easily overlooked when deadlines are tight and profits are low.

The author's central recommendation to improve quality in the private residential property construction sector is as follows; each developer/builder must engage the services of a quality control officer/clerk of works or similar. This professional would be involved from the inauguration of a project, much like a CDM Co-ordinator, right through to completion. As a quality control officer their roles would include;

- Assisting with design works to ensure troublesome details, identified on previous developments, are redesigned to become more effective and practical.
- Bridging the gap between the design team and the construction team to produce a collaborative approach in producing a quality end product.
- Inspecting construction works throughout all stages of each property.
- Assessing contractors' performance to ensure their quality of work is up to the required standard.
- Maintaining a record of the materials used to build the property such as bricks/render, roof tiles, kitchen units, floor coverings etc, this record can be given to the new owner on completion. This record will assist contractors should any remedial works be required to the property in the future.

This would have to be underwritten by legislation to ensure the scheme is fully adopted. Health and safety requirements cannot be reprioritised when a developer/builder deems fit and nor should quality.

The cost of having a quality control officer involved throughout a project may seem money wasted to a developer/builder however, costs can be offset by the following savings;

- Higher quality end product resulting in fewer requirements to re-attend properties to undertake remedial/snagging works.
- Increased confidence from potential home buyers who know the developer/builders' homes will contain little or no defects therefore permitting the quicker sale of homes.
- Easier to understand specifications and drawings containing feasible design details will allow homes to be built correctly and within a reasonable timescale
- Cheaper new home warranty premiums due to lower claims filed against the developer/builder.
- Decreased customer care requirements due to lower complaints relating to defects/snags.

The alternative option to this would be to increase the number of statutory inspection stages for both building control and new warranties. The main drawbacks with this are;

- Defects/contraventions are identified however, will the causes be investigated and changes made to the designs as a result?
- Each property on a particular site can be at different stages, constant visits would be required to ensure each stage is inspected.

At the very heart of this drive will be to increase the incentives for developers/builders to take on more apprentices and invest in their workforces' knowledge and skills. Houghton-Evans (2005) provided the following salient line of reasoning;

*“The best design is of no value if workmanship is inadequate. Good design assists workers but it does not prevent errors on site. Site supervision and inspection can catch bad work but it cannot create good work. Skilled tradesmen cannot safely be replaced by unskilled workers no matter how good the inspection and supervision.”*

## **8.5 Limitations of your research**

It was difficult to acquire enough willing participants to take the time to participate in this study. In addition, obtaining an equal number of respondents for each profession would have been the most effective means to avoid bias in the questionnaires. Each profession will have their own personal and business motives which influence their answer.

## **8.6 Further research**

The respondents who participated in this research operate in the Norfolk area in the private property construction sector. To obtain an overview of the quality of home

building in general, this study would have to be expanded to include respondents throughout the UK and also include social housing.

It would also be interesting to ascertain the effect of Zero Carbon Homes and the Consumer Code for Home Builders Scheme, have on residential properties in the future.

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## 10.0 CV and Exit Plan



Please see appendix A

## 11.0 Appendices