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# DraftMarker

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The Review

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## Table of Contents

Executive Summary .....	4
Overview .....	5
Rationale .....	5
Methodology.....	5
Product Components .....	5
Key Limitations of Current DraftMarker Site .....	6
Monthly Bandwidth .....	6
Application Server Performance.....	7
Extending User and Teacher Functionality .....	8
Teacher Comments Display Methods.....	8
Secondary Limitations of Current DraftMarker Site .....	9
Concurrency.....	10
Scalability .....	11
Persistence.....	11
Security and Encryption .....	11
Integrated Merchant Services.....	12
Aesthetic and Layout .....	12
Teacher_signup_1.aspx.....	12
Teacher_profile.aspx.....	13
Lack of Client-Side User Proofing.....	14
Critical Success Indicators .....	14
Evaluation .....	16
Future Directions .....	17
Retest Primary and Secondary Limitations Already Identified .....	18
Bidding By Time .....	18
Purging and Other Expirations.....	18

Aesthetic Detail.....	18
Legal, Ethical and Moral Terms and Conditions.....	19
Instant Payment Listener .....	19
Cleaning the File System .....	21
Security Administration .....	21
Protocols .....	21
Help .....	21
AJAX .....	22
Capturing User Data.....	23
Machine Key Failed .....	23
Confusion in Bidding System.....	23
Bids Disappear on Payment .....	23
Service Awaiting.....	24
Lack of Adequate Prompts.....	24
Necessary Functionality .....	24
Administrator .....	24
Teacher .....	24
User .....	25
Marketing.....	25
Concluding Remarks.....	25
References .....	26
Appendix A: DraftMarker Database Diagram .....	27

## Executive Summary

This report contains a review, assessment and suggested future directions of the DraftMarker site following its immediate initial construction.

From conducting this review process, it very quickly becomes evident that the DraftMarker site is not ready for commercial customer use. There are serious flaws in its functionality; and its reliability, aesthetics and performance are all questionable. These flaws are attributed to the lack of time, expertise and financial resources available to the developer. The site itself demonstrates some features that meet the original requirements and critical success elements identified in planning to some extent. However by launching the site without correcting the flawed elements, there is a very high risk of the site damaging its credibility and (thus) its potential market share.

Thus, it is recommended that:

- **The site is currently not ready for live commercial use;**
- The limitations of the site (including flaws in functionality) identified in this document are fixed, either through further development or other mitigation strategy (e.g. outsourcing, leaving out or finding alternative methods);
- Any further judgement or evaluation of the site is left until its expected functionality has been realised.

Following commission of further development work once agreement has been reached on the recommendations put forward, the site will be prepared for an initial pilot / test study where re-evaluation will take place.

## Overview

Following commission on the **###/###/###**, the DraftMarker site has been created with the intention of satisfying the business aims as outlined in the initial proposal. The following project review process utilises both objective and subjective criteria and critical review practises to best measure the overall success of the DraftMarker site. Through this measurement, a final evaluation of the DraftMarker site will be formulated. With this evaluation in mind – and to conclude the project review process – a current and future appraisal of the technical directions, business effectiveness and utility value of the DraftMarker site will be offered.

## Rationale

The DraftMarker initial proposal document identified a significant and substantial market opening at which the constructed site was intended to target. To achieve this, it was evident in planning that the success indicators and risk mitigation strategies identified in the initial proposal must be satisfied for this site to be implemented as required by all involved stakeholder standards. To avoid sustaining unnecessary loss or hardship to the DraftMarker concept, it is imperative that the following project review phase be instigated.

## Methodology

The success of the DraftMarker site will be measured by:

1. Identifying the product components;
2. Identifying limitations **within** these components based on the requirements as outlined in the proposal;
3. Measuring the site based on its critical success indicators (also identified in the initial planning documentation);
4. Appraising the overall efficacy of the site based on the limitations identified in the product components, as well as the evaluation of the site based on the listed critical success indicators.

Following ascertainment of the DraftMarker site value based on the outcome of this methodology, the value, usefulness and effectiveness of implementing present and future development strategies (if necessary) will be investigated. To realise the aims of this review, an initial assessment of the product components currently completed must be documented.

## Product Components

The scope of the DraftMarker website, in its current form at time of completion, consists of a number of components that interrelate in order for the site to function as correctly intended. A loose categorisation of each of these elements that enable this final functionality is possible, and will provide the scope under which the project assessment can take place. The *three-tiers* of the DraftMarker site presented at final demonstration are:

- The *data* layer, consisting of:
  - 1 x MSQl Server Database (as shown in *Appendix A*), with:

- 18 tables with integrity and foreign key constraints enforced;
  - 4 triggers (specifically on tables “Complaint”, “Payments”, “Service” and “Verification\_Claims”);
- The *application (processing)* layer, which contains:
  - 40 C# classes separated into .Net C# files (ASPX.CS extension) that are compiled at runtime into an assembly (dynamic-link library file - DLL extension) which provides application functionality; this can be further categorised by:
    - 15 classes that provide User level utilities;
    - 10 classes that provide Teacher functionality;
    - 25 classes that allow Administrator access (7 in the root directory, 18 in the “wwwroot/admin\_tablegrids” path);
  - Web server file hosting space (discussed below), that is accessed via these classes;
- The *interface* layer, which also consists of:
  - ASPX page interface files for each of the classes identified in the application layer;
  - CSS styling and imagery (contained within the “wwwroot/css” path);

Furthermore, some assets were outsourced due to the relative cost and time available for the DraftMarker project in its initial stages. The feasibility of these outsourced components warrants further investigation during the project review process. The external assets outsourced that were necessary to provide functionality in this application include:

- The third-party web application hosting server, provided by <http://www.aspwebhosting.com.au>
- The domain-name server, provided by <http://www.joker.com>
- Merchant account services for purchases, provided by <http://www.paypal.com.au/>

All of the components listed above will now be investigated to identify vital limitations in the use of the DraftMarker site in its present state.

## Key Limitations of Current DraftMarker Site

The following limitations have been identified in alpha testing of the Draftmarker site, and as such are listed here as **essential limitations to the immediate use of the site**. Without addressing the issues discussed in this section, it would be of **high risk** to activate the site for immediate live use.

### ***Monthly Bandwidth***

The third-party host that the DraftMarker site has been created upon currently suspends site activity after 7500 megabytes of traffic bandwidth per month. According to the Web Hosting Knowledge Site (2009), the equation to calculate the potentially required bandwidth of the DraftMarker site is:

$$\text{Bandwidth needed} = [(\text{Average Page Views} \times \text{Average Page Size} \times \text{Average Daily Visitors}) + (\text{Average Download per day} \times \text{Average File Size})] \times \text{Number of days in a month (30)} \times \text{Redundant Factor}$$

Thus, to estimate bandwidth initially needed for a pilot at 1 senior schooling environment (at an estimated potential of 200 visitors) =  $[(20 \times 20\text{kb} \times 200) + (200 \times 50\text{kb word files})] \times 30 \times 1.8\%$  redundancy factor (80% chance initially of spike due to virality chance – safest option); thus the bandwidth needed would be (80mb use + 10mb downloads) x 30 x 1.8... which would equal an estimated **4860 megabytes of traffic per month for a pilot school.**

The current plan would accommodate this (with 2GB to spare) however if the market share of the concept took flight at the perceived rate, a doubling of the traffic estimated from a future pilot would mean an **immediate increase in the plan / bandwidth available would be critical to maintain service.** It is estimated if the “virality” of DraftMarker were to “catch”, the arithmetic increase in traffic would soon become an exponential increase relatively quickly.

The 700mb available disk space will need to be monitored – 3mb upload limits have been imposed on all files, which would take 233.3 files of the maximum available size to reach the allotted 700mb of space (minus site space which is negligible). Both the traffic and file upload size will need to be closely monitored, as these both form limitations to the potential of the DraftMarker service. Although bandwidth and size are strong indicators of web hosting providers, more importantly server performance including maintaining server stability, uptime and load balancing (which is externally controlled) must now be investigated.

### ***Application Server Performance***

Currently, the hosting account shares CPU and memory usage with other sites located on the server, as well as processes, ports and database usage. The DraftMarker site is currently **not** running on its own dedicated server. This can cause significant problems if the other sites are overusing the physical resources available on the server. It cannot be guaranteed that if this is the case, it will be immediately monitored or fixed. This is a potential risk in ensuring service availability that can be fixed using either a dedicated server or (preferably) *a more specialised cluster management plan.*

Through further investigation, it appears there are some measures in place within the *third party* application to best ensure server uptime. However, the developer of the DraftMarker site does not have physical nor remote access to Administrator accounts anywhere within the server cluster. According to the *third party* ASP Web Hosting Terms and Conditions (2011), the data centre itself maintains two simultaneous network connections to each server, so that a broken connection will revert to the other. Running Windows Server 2008 R2, and given the (comparative) cheap cost of the shared hosting currently be used, it can be anticipated that the current DraftMarker cluster environment is utilising *High Availability* solutions (as opposed to mirroring execution on two separate physical servers using *fault tolerance*). The benefits of high availability solutions utilising failover clusters are significant to ensuring continuous service across a range of potential outages, as will now be explained.

The cost of fault tolerance (in terms of extra physical resources and performance cost of step locking execution on both systems) is evaluated by Christensen (2010), who explains that high availability solutions can better respond to a wider range of potential system faults through server cluster health monitoring and using failover clusters to restart a web application on another server in the cluster pool. In this case, an equivalent fault tolerant system running a common operating system – suffering the same flaw in the same circumstance – will affect both physical server environments and thus bring an entire solution down. It is important to note that if the current *third party* host (<http://www.aspwebhosting.com.au>) is set up to run Windows Server via a *Virtual Machine* implementation (multiple operating systems running isolated on the same physical machine in order to enable higher accessibility / availability and quicker disaster recovery), these high availability solutions will not be available (Christensen 2010). Given this, it is recommended that if the DraftMarker service experiences initial success, the site itself **must be moved to a specialised shared cluster host** that is managed utilising Microsoft Server 2008 R2 High Availability solutions.

### ***Extending User and Teacher Functionality***

It is evident, that both user and teacher services need further development to integrate expected services and to personalise the site and experience to greater effect. Users and Teachers both must have the ability to reset passwords automatically via email confirmation (Currently only administrators can change passwords, but not reset passwords). This is a definite requirement of a functioning site before publishing (it is certain a teacher or user will forget their password!). By invoking a request to a compiled PERL or C script residing on the server via a Common Gateway Interface (CGI), an email containing a reset password can be emailed to the supplied email address. This was not completed in the current version of the site, and is a **critical** (yet overlooked) element to the success of the site.

In addition to this, a support base, contact form, and other methods of communicating with the sites owners and moderators do not exist (only a complaint form based on a complete service currently exists). This is *unacceptable* to any current commercial web venture, as it lacks authenticity of a genuine company providing customer support. This must be addressed immediately before pilot trial of the site, as the reputation for site treatment of customers will remain sceptical at best without this change.

### ***Teacher Comments Display Methods***

The following image best highlights the flaw with the positioning of the teacher comments at *teacher\_bids\_status.aspx*:

*The image can be found on the next page.*



**Draft Marker Assessment Feedback Service**

Requests Bids Made Service Area Logout

**Bid Status:**

*Awaiting* - user has yet to select a bid.  
*Declined* - user has declined your bid.  
*Accepted* - user has selected your bid, and

**Bids Made:**

Made to	Amount (\$AUD)	Bid Logged	Your Comments	Bid Status	
raoul_w	0.05	Monday, 2 May 2011 12:16 PM	[show popup]	Declined	More
Drubazoid	0.03	Monday, 2 May 2011	[show]	Declined	More

Browser window: http://www.draftmarker.c about:blank Good try

This is **very poor practice** – browsers without JavaScript enabled will be unable to read this. This practice need **serious** and **immediate improvement**, preferably and suggestibly by using another page, an expanding comment box (using AJAX), or at the least moving or resizing content areas to better accommodate the desired comment. An alternative was also employed in *offers.aspx*:

**Draft Marker Assessment Feedback Service**

New Request Logout

Requests  
Teacher Offers  
Service Area  
Complaints

**Teacher Offers:**

RTN#	Subject Name	Teacher offering help	Price for help (\$AUD)	Date / Time Teacher Logged Bid	Teacher Comments
1	Maths (General)	maltese	0.04	Monday, 2 May 2011 1:19 PM	[show]
92	Legal Studies	azzurri	1.00	Sunday, 15 May 2011 5:26 PM	[show]
85	Maths (Extension II)	azzurri	10.00	Sunday, 15 May 2011 8:59 PM	[show]

With selected bid:

**Teachers Comments:**

*Will give as much help as i can.*

drubazoid Teacher Profiles Subject Descriptors

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Teacher Comments appear in right\_column division which originally inherited the maximum height of the middle\_column or left\_column division heights (whichever was larger of the two). Ultimately this meant that if a teacher comment was larger than the available height on the page, the comment's overflow would be cut (the container division for these columns has the *overflow: hidden* style set to fix an early Internet Explorer CSS rendering bug). The only way to finish reading this comment would have been to go to the page source. This was a serious flaw, which was (thankfully) fixed using liquid *faux columns* (Cederholm, 2004). Still, the author believes an expanding Ajax style comment box (where part of the comment is shown, and the user can simply click "more") would be the optimum solution.

## Secondary Limitations of Current DraftMarker Site

The above limitations of the site must be immediately addressed to best ensure successful reception of the DraftMarker site. Further to this, there are secondary limitations in the presentation of this

site, which do not need to be addressed immediately, but certainly need to be considered for immediate continued development following the launch of the site in a pilot or any significant beta test phase, case or study.

## ***Concurrency***

Allowing multiple users concurrent connection to the DraftMarker service is imperative to the correct functionality of the site. The .Net technology used to create the DraftMarker site enables a new SQL connection to be established using the same connection string (i.e. the same connection pool) each time data is to be retrieved from the database by any number of concurrent clients. However, through process of not closing the connection (i.e. omitting the *draftmarkerConnection.Close* from the C# code), it was found that the site could be crashed with over 100 concurrent connections, delivering the following page error:

*System.InvalidOperationException: Timeout expired. The timeout period elapsed prior to obtaining a connection from the pool. This may have occurred because all pooled connections were in use and max pool size was reached.*

It is important to note the specific number of concurrent connections it will take to crash the DraftMarker site is difficult to identify, as the .Net architecture reserves its own methods for cleaning up used system connections and resources. However, the nature of this error suggests that a connection pool with 100 connections available should be sufficient for site operation, as most database retrievals within DraftMarker can be measured in milliseconds (upon which the available connection is returned to the pool).

Through application testing, there appears to be limited potential for competition to exist between data resources. For example, an Administrator may view an application for teacher authentication containing a file “degree.jpg” – which after the Administrators .Net page has been rendered (i.e. completed the ASP.Net Page Lifecycle), the Teacher may remove the uploaded file. The SQL Server database used by DraftMarker is currently maintaining data integrity through *pessimistic concurrency* (the default concurrency for SQL Server 2008). This enables shared, update and exclusive locks that are implemented at the table levels depending on the type of operations the Users, Teachers or Administrators are performing on any given record (MSDN 2011). These locks maintain integrity at the bottom tier (data-tier) of the application, and prevent inaccuracies in data between concurrent users. It must be noted however, that if a rare competition existed between resources at this level (especially a race condition where two transactions waited in deadlock for each other to complete) there is currently **nothing** in the DraftMarker application layer to handle this.

Both of the above risks could be (to some extent) mitigated by setting a timeout property in the application layer as discovered during testing. This was not included due to time constraints, however setting the *SqlConnection.ConnectionTimeout* property in the *System.Data.SqlClient* class would alleviate connections that do not return a result. If the DraftMarker site extends its functionality, increases its user base, or requires another form

of scaling up or out (the next topic of discussion), the concurrency discussed in this section must be maintained to provide an adequate level of service to all end users.

### ***Scalability***

The ability for SQL Server 2008 (the database management system upon which the DraftMarker service has been built) to be scaled both up and out depending on the number of clients is best detailed in a Microsoft White Paper titled SQL Server 2008 Performance and Scale (2008). The Microsoft White Paper (2008) identifies that SQL Server 2008 allows hardware to be added without stopping database instances (provided the hardware allows this scaling up), offering better replication for scaling out, and better meeting concurrency issues through a greater degree of isolation of a committed rows result (assuming enough users were synchronously or asynchronously accessing the same data). Thus, the technology upon which the DraftMarker site has been built has some capacity for scalability – although this will largely be determined by the financial cost, viability and feasibility of the desired scaling.

### ***Persistence***

Data persistence (i.e. maintaining access and manipulation to data for concurrent users, as well as managing resources that enable this) has been enabled in the DraftMarker application utilising .Net architecture – in particular the .Net Data Provider framework (ADO.Net) for SQL Server. The SqlConnection class enabled connections to the data source transparently, however the DataAdapter components (providing a transparent layer of data control abstraction) were not utilised until the Administrator Records section of the site. Literature was found to customise styles on both Grid and Details controls (used in the file *admin\_authenticate.aspx* is a reference from ASP.NET Codebook, 2008). The exclusion of the use of more ADO.Net controls to provide greater data transparency was due to a lack of initial developer knowledge and experience within the .Net framework, and made the application itself unnecessarily complex, and will **increase difficulties** when scaling up or out.

The application server itself provides a level of persistence, but as has been discussed above, without remote access to any management environment (operating system, web services provider or other middleware application software) of a dedicated server (or server cluster), it is difficult to ensure at this stage that resource management is configured for optimum performance. Thus, the persistence warrants further investigation following successful pilot reception of the DraftMarker site.

### ***Security and Encryption***

Passwords are the only hashed data used on the site for Users, Teachers and Administrators, and this is done using a one-way MD5 encryption algorithm. All other data is stored as plain text, which may offer some potential flaws. The valued file data of teacher qualifications and intellectual property is accessible via absolute URL, while the sensitive data of identity specific information and banking details is stored (as stated) in plain text. This is not critical to the launching and testing of the site, but the secure practises offered by the DraftMarker site must dramatically improve if the site was to become profitable. The security provided

by regular incremental data backups must also improve; these are yet to be automated, and yet can be done so within the server environment. The “backed up” data must also be secured. The file upload facility can easily tag each file with a universal resource key, which could be used in conjunction with session state tracking in the application layer to prevent unauthorised access. The server itself must use CGI scripts to prevent a direct download of any files discovered through absolute URI’s.

The session state tracking currently used in the application layer prevents unauthorised access to Users, Teachers or Administrators not logged in (using the *HttpContext.Current.Session* property). This layer also prevents caching of the application files, as the dynamic nature of this application requires results that are current (and not taken from a recently replicated client-side copy). This lack of client-side caching can significantly slow down resource access. It is recommended that investigation continue into Ajax enabled caching strategies, so that the entire DraftMarker site does not need to be reloaded in the client browser unless it has expired after a longer period of time, yet results can still be refreshed immediately to be kept current. This smarter version of client-side caching will dramatically improve the performance of the DraftMarker site.

### ***Integrated Merchant Services***

The use of PayPal as a merchant service for this site has been proficiently integrated. However, in its current form users navigate **outside** the site environment to pay for the service. This does not affect the outcome, but may initially discourage buyer conversion (it is not a pleasant experience to be redirected from a familiar site environment to an external pay site). It is strongly recommended that the developers of this site approach an Australian based Banking / Financial Institution to act on behalf of DraftMarker to provide merchant services; furthermore, it is recommended that this transaction process be integrated within the DraftMarker interface, so that no foreign site environments are required throughout the entire process.

### ***Aesthetic and Layout***

The following pages are *indicative* of aesthetic and layout challenges presented during the development of the DraftMarker site:

#### **Teacher\_signup\_1.aspx**

Currently, on error during the teacher sign-up process, the following error is displayed upon empty field completion:

*The image can be found on the next page.*

<b>Bank Details</b> (for payment of services):	
Account name:	<input type="text"/> ***
Account BSB:	<input type="text"/> ***
Account number:	<input type="text"/> ***
<a href="#">Save and Continue</a>	
<b>Passwords not matching or empty fields. You made mistake(s)!</b> <a href="#">Users</a> <a href="#">Teachers</a> <a href="#">Subject Descriptors</a>	

This error is non-intuitive. The user is not informed on which field contained the error. This error checking is currently server-side, which needs further coding to derive the correct field causing the error and returned to the client (this was not completed due to time constraints. This is a simplistic task yet it is time consuming, and thus was left out of the final build. The error checking throughout this site needs to be implemented more using JavaScript (again, a simplistic task, yet left out due to time constraints).

Furthermore, the positioning of this error feedback message is poor. The ideal positioning would be equivalent to the *lblFeedback* used on the *Default.aspx* page – positioned at the top of the middle division (which is the first area that appears on Post Back). Note the error message does not fit within the inline width of the .class controlling the style of the text; and thus causes the inline width of the footer division to disproportion (hence the new line). The left-margin style of the <a> tag could be adjusted in this instance (a simple fix).

## Teacher\_profile.aspx

When a teacher edits their profile, it is evident that there is not enough width in the middle\_column division for the claims list box:

**My claims -**

**Possible ratings:**

*Select a category.*

*Select potential claim.*

Degree (Honours) ▲

Recognised Teaching Award at Distri

Recognised Teaching Award at Scho

Recognised Teaching Award at State ▼

This was a poor choice of control, and as such there is a “trial and error” process to read the entire claim (horizontal scroll bars were not enabled). This is an unprofessional and unacceptable level of presentation, and severely detracts from the sites usability.

## ***Lack of Client-Side User Proofing***

Due to time constraints, a significant of form validation using client-side methods (e.g. JavaScript) has been left out of the DraftMarker site in its current state. Client-side scripting has been used currently for critical selections only, such as file manipulation areas, or areas of the site that require mandatory selection to be made. A large number of INSERT operations currently are validated by the server – this dramatically increases server load pressure, decreasing overall application performance and increasing waiting times. The larger form validation areas, such as signing up (*teacher\_signup\_1.aspx*), users signing up (*default.aspx*) and users placing new requests (*newrequests\_1.aspx*) could all primarily use client-side scripting first to validate data before being passed to the server (which incidentally still should validate the same data, however the chance of valid data increases when used in conjunction with client-side scripting). Thus, more client-side user proofing required using JavaScript will enhance server performance as more data is passed between the interface, application and connection tiers.

There are more limitations to the site than can be listed here. Predominantly the issues discussed thus far are key considerations when designing an Enterprise System such as DraftMarker; although certain design flaws have been alluded to. The remaining issues (not discussed here) are concerned primarily with functionality of the site itself, although these issues are somewhat interconnected with those mentioned above. Although they do not limit the immediate use of the DraftMarker service, it is in the best interest of Draftmarker to address these issues further below.

For now, the author will turn to evaluating what is presently complete in the DraftMarker site, before further revisiting the other limitations mentioned here in the *Future Directions* section below.

## **Critical Success Indicators**

The following Critical Success Indicators were identified in the initial *ECOM Proposal Documentation* file as to best formulate the basis for assessing success of the product in meeting the **intention** of the DraftMarker site. Thus, the following table outlines an assessment of each criteria within these success indicators:

<b>Criteria</b>	<b>Assessment</b>
Privacy	Currently, privacy is only ensured through MD5 hashed algorithms. Direct file download links are enabled (which have been discussed above) and this enables a potential privacy breach for both sensitive identity files and intellectual property (although directory browsing is disabled offering little protection). The actual anonymity of the site relies on the use of “Pseudo-names”, and users are not asked to supply a real name. The use of the show and hide teacher functions further enable real anonymity.
Authenticity	The authenticity of the site is debateable. There are national registers to check teacher registration, and school email usage to enable a further check on credibility. With original files being scanned as verification proof, it is difficult to discredit the genuineness and authority of teachers as an online

	venture; however, the “look and feel” of the site given its present functionality to establish credibility and authenticity will be difficult.
Commercial Value	Currently, the expenditure has been minimal (the cost of development has been absorbed by the author). The legal process of extracting agent fees has yet to be fully developed (e.g. declarations of employment, GST, withholding tax and other payroll functions). The commercial value of the site will be better determined following its pilot inception.
Individual Identity	This will depend on the authenticity discussed above – the site must be fixed to industry standard; it must be advertised through search engines, social networking and word of mouth; and through this it must “snowball” some success cases to establish a DraftMarker Individual Identity.
Customer Use and Engagement	The <i>Customer Use</i> and <i>Engagement</i> criteria cannot be commented upon until the site has been live tested. It remains to be seen whether the site will generate hits / traffic. Certainly, without fixing the limitations discussed in the document, the site will have far less chance of engaging customers.
Aesthetics, Control and the User Interface	The sites aesthetics are comparably poor compared to an industry design standard as to what is expected for a successful enterprise system. This is a by-product of the time and the lack of expertise of the author of the site. Currently, the control of the user interface requires further work (discussed throughout this document) to comply with a competent industry standard.
Reliability	The limitations of the shared hosting, in the ability of the site to ensure concurrency have been documented above. The discussion of bandwidth, server performance (including high availability clusters) and persistence are also further relevant to this criteria. These discussions can be found above in primary and secondary limitations of the DraftMarker site.
Robustness and User Proofing	There is not enough client-side validation in this site, and due to the pressure on the server certain requests may experience high latency. This is well documented above, and without a completed help system including immediate client feedback (perhaps using AJAX) there is currently a high chance of user frustration in using the site.
Help and Service	Very poor help and service has been included on this site (as just mentioned). The lack of a contact or feedback form needs immediate attention (this was left out due to time constraints). Currently help exists in the form of brief prompts; complaints and feedback are only available on services themselves.
Platform Independent	The site has been fully tested on current and previous versions of Internet Explorer, Mozilla Firefox and Google Chrome. The site also functions as expected on mobile browsers such as Opera and Safari. The functionality errors discussed in this document are independent of the browser used.

	There is no WAP version of the site, although this was not included in the original objectives.
Crisis Response	The security (and security of data) for the DraftMarker site is in the hands of the third party hosts. They offer UPS backup (with diesel fuel powered generators), a dry fire extinguishing system, and redundant (in this case available and more than enough to cover – but unused) cooling systems ( <a href="http://www.aspwebhosting.com.au/about.aspx">http://www.aspwebhosting.com.au/about.aspx</a> ). The site itself is backed up offsite, but is not automated to recover in a complete system loss. Automated backups of all data have yet to be scheduled.
System Development	The system has been developed using .Net architecture to an amateur industry standard. This is a by-product of the inexperience the developer has had with C# .Net (an unseen language to the developer upon task commission). The application tier requires significant improvement as has been discussed in this document. The discussion on persistence is most applicable here, especially the abstraction ADO.Net provides (this abstraction should have been more thoroughly utilised throughout development).
Sustainability	The site has yet to be proven sustainable. DraftMarker will refine ethical and legal standards for the site following its improvement and trial phases. The site currently warrants some merit, and depending on cost may be worth further developing to at minimum a trial stage. The scalability of the system is currently workable – there is reasonable ability for the system to “grow” (this has been discussed above).

## Evaluation

To formulate a successful assessment on the effectiveness and success of the DraftMarker site, it is necessary to take into account the research thus far into the limitations and critical success elements, and couple this with the original site objectives defined in the initial proposal file. The following list summarises the original objectives of this document:

Objective	Assessment
Account Hierarchy	The site content based on a <i>User</i> , <i>Teacher</i> and <i>Administrator</i> hierarchy of privileges was achieved to some extent. The MD5 hashing of passwords and use of HTTP session tracking enables access to content based on user level access. Further checks in security could be implemented in the data tier (by adding and restricting access to more SQL Server user groups).
Transaction System	The site enables <i>Users</i> to select a <i>Teacher</i> bid, and pay for this using a third-party merchant service. Although rudimentary, the payment notification listener that is returned from the outsourced merchant service fires a trigger in the database that correctly processes the paid bid for service. In addition, SQL is used to check that the



	<p>amount paid by the <i>User</i> is equal to the amount bid by the <i>Teacher</i> (this, again, is elementary fraud checking, but necessary). The service will not log if these two pieces of data do not match. The third party merchant further offers a tax invoice, although the binding legality and the DraftMarker roles in providing accounting and payroll services need immediate attention. The transaction system is underdeveloped for an industry standard Enterprise system.</p> <p>The atomicity of the transaction system has already been discussed above in <i>application server performance</i> section.</p>
Aesthetics and Functionality	<p>By this stage of the project review it is clear functionality and aesthetics were not “up to scratch”. Many expected features, such as resetting passwords via automatic email, <i>Teachers</i> viewing accumulated <i>User</i> statistics before offering to provide service, and sorting and ranking algorithms for teachers were incomplete due to time constraints. If the original DraftMarker concept was to be realised, significant time must be invested in further developing this functionality. It is very strongly recommended that a professional Graphic Designer be consulted to bring a significantly higher aesthetic appeal (and detail) to the DraftMarker web presence.</p>

Overall, as a prototype, DraftMarker performs *as expected* based on the cost, expertise and time available to develop the site. However, as an industry standard Enterprise system providing a commercial (and thus legally responsible service) the site is **not yet ready to go live**. It would be of **considerable risk** to reputation (and thus future profits) to launch this incomplete site. *Any further judgement of the site should be reserved until completion or mitigation of all of the corrections and limitations discussed in this document have been completed*. As this functionality is critical to the DraftMarker idea, bringing the site in-line with its full expectation warrants the immediate future action to be taken. These elements not already mentioned requiring amendment will now be listed.

## Future Directions

As was alluded to earlier, the *future directions* section contains further design flaws (predominantly concerned with functionality) that dramatically affect the usage of the DraftMarker site. These flaws were known at the time of previous concluding remarks, and thus taken into account for the conclusions to be made. They were left until this section to document as recommended future development work, that should be addressed immediately following the mitigation of the Enterprise System limitations and critical functionality points made earlier. It is important to note here that many strategies may exist to successfully solve the problems presented by these (as well as the aforementioned *primary* and *secondary*) **limitations**; for example, out-sourcing, leaving out or finding alternatives may be necessary if a suitable code or financially viable solution is not possible or feasible. To reiterate, these flaws can usually be attributed to a lack of financial resources, expertise and (most commonly) time available to the developer.

Thus, including the primary and secondary limitations, the following *further functionality considerations* must be addressed to adequately develop the DraftMarker system to an expected and acceptable standard.

## ***Retest Primary and Secondary Limitations Already Identified***

The importance of first fixing the aforementioned primary and secondary limitations of the DraftMarker site cannot be understated. Finding solutions to these limitations warrants significant re-testing, to ensure that before continuing, the minimal required functionality and integrity of the site is in place. It can be noted that this is suggestive of *Scrum* (a type of agile) development, which would at this stage better suit the DraftMarker development process of an earlier release coupled with iterative, incremental development releases of future functions.

## ***Bidding By Time***

Currently, no trigger exists in the MSQL database – nor does any mechanism exist in the application layer – that expires bids not reached by the **chosen agreement time**. As a function of the database, this could be checked periodically, updating a *Request.Request\_Status* field to “Expired” if the request has passed its *DateTime\_required\_agreement*. Alternatively, an Administrator function called easily iterate through the request records, marking each request that has expired. Both solutions require a *Request.Request\_Status* field to be created – not allowing NULL values, and with default value as “Alive”.

## ***Purging and Other Expirations***

As is discussed in the *Bidding By Time* functionality flaw, there are many other expirations that require a removal tool in the Administration application layer or a trigger in the MSQL database (or even a combination of both solutions). In summary, the User or Teacher (depending on which function relates to each) should **personally** also be able to purge before expiry:

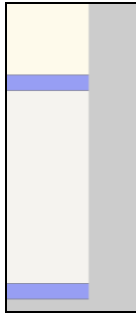
- Services (removed or archived after 90 days)
- Requests (removed or archived after 2 weeks of expiration)
- Complaints (removed or archived after 90 days)
- Half complete Requests, Sign-ups, Users or Teachers or any other records that have not agreed to DraftMarker terms and conditions (removed immediately)

The implication for not archiving or purging these records is cluttering on-screen, wasted storage space, slower searching and ultimately incorrect data. The Administrator should have more automated record management functionality, which can ultimately manually or automatically purge records on a daily / weekly basis. The Administrator ability to daily / weekly perform incremental backups should also be included here – under the umbrella of more (useful) record management functionality.

## ***Aesthetic Detail***

Due to financial and time constraints, the aesthetic details to the site were not completed to professional standard. For example, the *default.aspx* yields a margin overflow due to the inserted *banner\_noWords.gif* in the *left\_column* division:

*The image can be found on the next page.*



Clearly, the elements in this and other divisions are inheriting 130 pixels from margins, padding or column widths, which is extending the container to 100% + the inherited width – resulting in the horizontal scrolling on the splash pages (Users and Teacher). This could easily be fixed by more time spent on the CSS alignment and correct positioning of images (using classes that do not overflow to the other elements).

It has already been recommended that a professional graphic designer be consulted about improvements made to the site. This recommendation is strongly endorsed by the author; comparatively, DraftMarker competitor sites (identified in planning) offer significantly more detail about their service. Currently, there are no testimonials, demonstrations, pitching of sales or literature to denote what the DraftMarker site is about, its mission statement or core ideals. The potential Users and Teachers would not read this (or the proposal) documentation as it is not offered in convenient format.

### ***Legal, Ethical and Moral Terms and Conditions***

Currently, there is no disciplinary action for non-completion of Services for Teachers. There is also no pricing structures or mention of agent fees. There is no illustration or guidelines for the distribution of money from Users to Teachers. Further to this, DraftMarker is not registered for PAYG withholding tax payments, so transferring payments to teachers may currently be considered a taxation breach. There must be a clear *terms of use policy* made publically available, that covers all areas of legal, ethical and moral usage of the site, including a full waiver of DraftMarker indemnity for any resulting losses sustained from any direct or indirect activities loosely or fully connected to the site. The DraftMarker service is intended as an arbitration and bartering service between Users and Teachers – and as such **must be** considered a distant third party in all legal, ethical or moral disputes. Rules, regulations and procedures for handling grievances or disputes must be clearly documented in the aforementioned *terms of use policy*. It should be noted at this point that as an internet venture, it is in DraftMarker best interests to seek legal counsel for an ironclad agreement through which all Users, Teachers and Administrators must abide before being allowed access to the site (currently there is only protection offered on Teacher bidding and signing up, as well as Users posting a new request and payment).

### ***Instant Payment Listener***

Upon completion (or attempted) payment for a service, the merchant services provider triggers a notification message which is sent to DraftMarker for processing. Utilising this, DraftMarker is able to trigger relevant Service records for teachers to begin service. The current version of this

“instant payment listener” file can be found in *ipn.aspx* which has been adapted from the *PayPal Instant Payment Notification Code Samples* (2011) to suit the DraftMarker purpose.

A brief illustration of (part of) the *ipn.aspx* file is shown here:

```
if (strResponse == "VERIFIED")
{
    //parameters are prepared for transaction INSERT (complete and tested)

    try
    {
        draftmarkerConnection.Open();
        insertIPN.ExecuteNonQuery();
    }
    catch (Exception error)
    {
        //this page is not viewed in a browser - the error must be logged
    }
    finally
    {
        draftmarkerConnection.Close();
    }
}
else if (strResponse == "INVALID")
{
    //payment was refused - log the payment status as INVALID
}
else
{
    //This needs further development - could quite possibly be fraud attempt
}
```

Due to time constraints, the IPN file currently affects change in the data tier if (and only if) **payment is VERIFIED**. Currently, any errors caught in the “catch” block of the insert query are not logged, as no extra table (in the data tier) or process (in the application tier) has been created to accommodate, log or investigate VERIFIED payments that were could not be executed correctly (perhaps due to Connection.Open failing). Further to this, any INVALID or other attempts (which may include attempted fraudulent activity) have not been handled appropriately. If the Connection.Open fails, and the Service fails to transpire, currently the Administrator will have to achieve this manually (which – in the current state of the site – will only occur after an email from the “frustrated” customer has been made). Mistakes like this are incredibly detrimental to any e-commercial venture, and as such a better system must be established to ensure thorough completion and conversions of Bids to Services for all received payments, as well as logging and handling of invalid (or other) payments.

While discussing the *third-party* Merchant service, it is noticeable that payment data is posted back to the DraftMarker environment via URL query string – this is received by the *thanks.aspx* page, but remains unprocessed. It was unnecessary (**more so insecure and dangerous**) to affect change in the database based on variables posted via URL query string; however the string could be used to display data on the return page with the thankyou message (i.e. this avoids using a new data connection and SQL query from the IPN above saving unnecessary app server load).

## ***Cleaning the File System***

Currently, in the Administrator table grids, when a file record is removed from any file table, the actual file on the server remains. This is poor design, as the Administrator currently has to remember the file removed, navigate to the file manager and remove the file (or folder) manually. A better file management structure must be enforced, so that a **single method** exists that **performs both tasks simultaneously**. The file records (data) and files (hosting space) are not independent of each other; they are entirely mutual – **a file record must not exist without the file itself** on the server (and vice versa).

## ***Security Administration***

The Administration View is currently available via padlock link from the front page of the site. These pages are highly secure, and this link must be taken down once the site is launched. It was discussed in the initial *ECOM Proposal Documentation* file that security was paramount to an e-commerce site such as this recording sensitive information about its customers. Currently, type safe parameters are used to avoid SQL injection, passwords have been MD5 hashed, there is server-side and some client-side object validation, and there is an automatic check in place to determine if parameters were tampered upon passing to the merchant service (the original *Bids.Bid\_amount* is checked for identical match **in every case** against *Payments.Amount\_paid* **before** Service is commissioned – this is performed by an *on\_insert\_is\_payment\_cleared* trigger within the PAYMENTS table). Regardless of this, without access to the Administration of the server or data centre, it cannot be guaranteed that all unnecessary ports have been closed, that necessary and adequate hardware and software firewalls exist, or that the site (given the young experience of the coder) is at low risk from hostile or invasive behaviour. Further to this, given the pervasive nature of the site, it is still vulnerable to a variety of Denial of Service attacks (to which the author cannot protect). It is recommendable that an independent security firm audit the site for potential weaknesses and risks in security.

## ***Protocols***

Previous discussion focussed on securing data within (and between) the DraftMarker site; to continue this, the cryptographic protocol TLS (Transport layer security) must also be implemented for transferring qualifications and banking details. This will provide another layer of security, and increase protection from listening or tampering with packet data messages. Mail protocols (SMTP, POP3 or IMAP4) could further be utilised by the .Net architecture to automate requests for new passwords, or to check school emails for automatic response to authentication. Thus, a DraftMarker *response-expected messaging system* needs full development for automated teacher authentication process, password changes and optional notifications, as this forms a critical part of the sites usability.

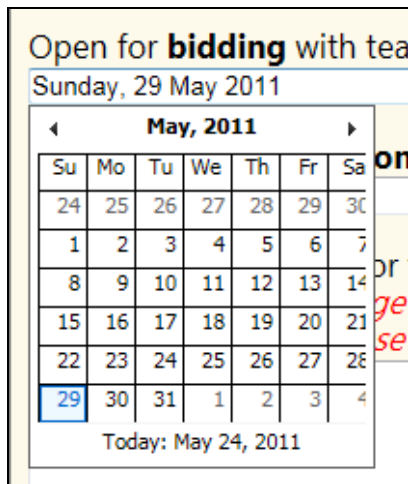
## ***Help***

Help systems are currently poor and as such, the reputation and customer retention to DraftMarker will surely suffer unless this is rectified. System contacts must be established, preferably through use of commercial or (initially) open-source forum, as well as videos,

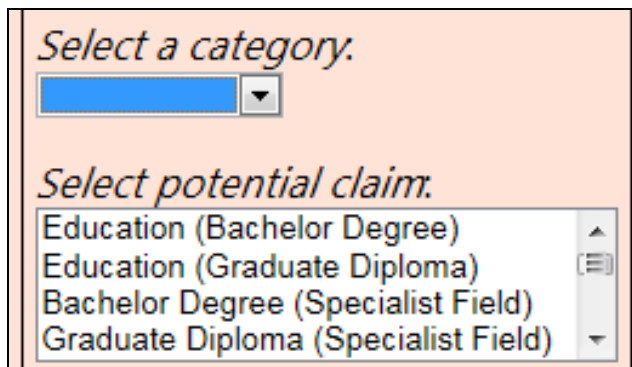
tutorials, tooltips and prompts to aid site navigation and customer use. Feedback is currently limited, and form validation does not specify directly which fields cause errors.

## AJAX

Ajax (Asynchronous JavaScript and XML) technology may be useful for embedded up-to-date request processing without the server re-executing the entire ASP.Net page lifecycle; this will in turn enable a live stream of Requests and Bidding. Ajax was used throughout the site, both for functionality and on-the-fly updating of controls. Functionally, Ajax methods offered useful methods for extended server control functionality:



For loading data into controls without reloading the page, Ajax offered further solutions:



As the pages are preferably un-cached due to their dynamic nature, Ajax may serve as a useful short-term technology that should be investigated further for a more intuitive user experience. As a footnote, it must be noted here that the last screen-shot shown from the DraftMarker site shows the category listbox being "repainted" without the selected value on-post. This is another aesthetic error that could easily be fixed with more time by either preventing the control being re-rendered or re-posting the controls value before re-rendering.

## ***Capturing User Data***

It is recommended that more data is collected on customers. IP Address logs should be kept and a *banned list* should be used and enforced as a function of the application server. The use of CAPTCHA software should be used for signing up accounts (to authenticate that the signed up account is *human*). Without this technology, the site could be used for DOS attacks or spamming if bots were used to automatically sign up for accounts. The IP Address logs would further inadvertently assist in collect market share data, identifying geographically areas of expansion and “hot spots” for the DraftMarker service.

## ***Machine Key Failed***

When using the site, on occasion the following error will appear:

*Validation of viewstate MAC failed. If this application is hosted by a Web Farm or cluster, ensure that <machineKey> configuration specifies the same validationKey and validation algorithm. AutoGenerate cannot be used in a cluster.*

There are numerous solutions to this error in the literature on the web. As this error occurs rarely and intermittently, the consensus belief is that on occasion the page being rendered is not complete before it is being posted back (explaining the failed **view state** portion of the error). This **could** be a by product of “*navigating quickly*”, especially if an image, text or other object has not completely loaded. The author found further evidence in testing that this error also occurs if the page **has been idle for some time** (in which case the server has terminated the instance of the application). There must be a custom error page created for this in future releases, as well as implementations and controls to prevent the page from re-posting until the page life cycle is complete. Some literature has suggested machine key generation in the *web.config* file; however, most literature read by the author seems that this is a “shift” to a different error (that also requires fixing) than a solution in itself.

## ***Confusion in Bidding System***

There is room for improvement in the logical order of the bidding system. Testing has identified that the following processes used by the DraftMarker service simply “do not make best logical sense”.

### **Bids Disappear on Payment**

The assumption here is that in the design stage, the premise ideated was that each *User* can only accept **one** (and only one) bid for help for the same request (similar to EBay only accepting only **one** final bid for an item). As such, the system was designed to automatically trigger the correct service record appearing for both *Teacher* and *User* upon completed payment, and *mark the other bids as declined*. Due to the marking of **Bid\_status** as either Accepted or Declined (after payment), neither of these will show in the Users bid section (only bids *Awaiting* payment appear). This is an easy fix, as a simple SQL query will show Accepted bids. However, this was not complete, as it was decided logically that the user may be confused as to whether or not the bid has been paid. This is suggestibly fixed using a

simple feedback message for Accepted marked bids – “Your bid is awaiting processing in the Service area”. Again, an arbitrary fix, but incomplete due to time constraints, and left for future development.

### **Service Awaiting**

When a service is new (for Teachers) or complete (for Users), it is recommended that a highlight element shows an awaiting service. For example, an email inbox uses the **Inbox (1)** – this could be adapted for DraftMarker purposes, and aid to decrease the confusion discussed above in site navigation.

### **Lack of Adequate Prompts**

In-house testing has revealed many users often asking “what do I do now?” For example, after the user has purchased a bid (using the PayPal merchant), the user is redirected to the DraftMarker site. The bid disappears from the bid section of the site and is “put” into the service section – and *none of this process is communicated to the user* through on-screen prompts. This is poor presentation, and with more time budget the “help” available on the site detail must be further implemented before commercial launch. The site must become more user-centred, and assuming nearly all users **will not** read instructions first (nor should they), the “flow” through the site must be made even more so incredibly obvious and user-proof.

### ***Necessary Functionality***

Although many tasks can be achieved competently by using automated functions on the site, there is room for improvement in each of the sections of the site.

#### **Administrator**

Administrators require the ability to bulk approve teacher Verifications (as opposed to individual verification for each claim). The record access methods are limited, and without a fundamental understanding of database theory a non-technical administrator would find the entire grid system inoperable. This means increased expenditure on training if other users were appointed administrators. The Administrator section should be redesigned with a non-technical POV in mind.

#### **Teacher**

Among other subtle functionalities missing when using the site, it is most noticeable that the current profile system requires teachers to choose from a list of categories – this was done so that **future developments** of the site could allow Users to use sort, search and rank algorithms to determine their “pick” of the teacher. It is **strongly recommended** that a “personal statement” field be added to the Teacher profile – so that the teacher has the ability to market themselves, as well as explain their awards, qualifications, experience etc.



## User

The lack of help for the User cannot be understated; in addition to this, the User would prefer a more organised system of presenting bids, requests and services; furthermore the DraftMarker system should show the *evolution* between these “states” of help for an individual request in a using a more intuitive approach. The ability to keep other records bids, ***purchase multiple bids***, as well as a **folder structure** (similar to email) that allows services to be kept, stored and retrieved would significantly improve functionality for the User group. Quicker and better stat tracking as well as the ability to **sort** by amount, date, rank etc would further aid the user-friendliness of the site.

## Marketing

The DraftMarker site is useless without customers (and teachers). It is suggested a **full marketing strategy** be employed, initially targeting a local area of schools (as a pilot) and then reassessing direction. The author and owner of the site has considerable industry consultation with teachers in Cairns (Queensland) secondary schools, and believes this may be a suitable place for initial pilot studies. The marketing strategy must utilise **Facebook** and **Twitter**, as these social network mediums offer a relatively neutral net medium through which promotion is highly viable, given the low cost to advertise within these sites. Furthermore, Google AdWords may be utilised to promote rank order in searching (in a pay-per-click or pay-per-result agreement). Bing and Yahoo may also be used as viable search engines. Word of mouth, other forums, teenage chat sites (including MSN) may also offer suitable and viable places to advertise DraftMarker.

## Concluding Remarks

There are many more aesthetic, functionality, design, technical and further limitations not discussed in this document that are evident upon further, thorough testing. Much testing to the site to support it in IE 6 (which required provisions through *.css* to *web.config* files) through to IE 9, Firefox 3 and 4, Opera and Chrome 11, and Safari 5 have all been considered in the final design. Although the site has many limitations discussed, the work completed has created a meritorious idea for future expansion. The site will remain **not live** to avoid consumer backlash and reputation loss at an incomplete product. The site will not become live until enough investment into the sites core functionality has been made.

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Unless otherwise specified in this section, this assignment is entirely my own work, utilising only the following references:

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# Appendix A: DraftMarker Database Diagram

