Computer Science IA Moderation Guidance

Couple of things that will help you to look into the IA criteria in depth-

The word count for the written documentation is 2000 words (the Record of tasks, diagrams and brief bulleted lists are not considered part of the work count). Obviously you are not expected to count the words up, but when you think the candidate has reached this [2000 word] limit, stop marking. Please pay particular attention to instances where the candidate is trying to "play the system" by including extended text (descriptions, explanations) in labels, bullet points and annotations.

If extended writing has been used in bulleted lists, then please treat this as normal text against the word count and provide feedback to the school that bulleted lists cannot contain extended writing.

The PM has defined ***algorithmic thinking*** as follows:
Algorithmic thinking is a component of computational thinking and it involves 'develop[ing] algorithms and express[ing] them clearly' (page 4 of the guide). This can take many forms - flowcharts, pseudo-code, flow diagrams, ERD diagrams, UML diagrams, etc.

It is expected that IB Computer Science candidates challenge themselves to create comprehensive solutions for real clients. Final solutions that are not implemented and/or not fully tested by the client (against the criteria) will potentially lose marks in criteria B, D and E.

Criterion A: Planning (6 marks)

The success criteria identified in criterion A will be used in criterion D to evaluate the effectiveness of the product.

Marks	Description
0	The response does not reach a standard described by the descriptors below.
1–2	An appropriate scenario for investigation for an identified client is stated. The rationale for choosing the proposed product is identified. The criteria for evaluating the success of the product are generally inappropriate.
3–4	An appropriate scenario for investigation for an identified client, providing evidence of consultation, is stated. The rationale for choosing the proposed product is partially explained and includes some appropriate criteria for evaluating the success of the product.
5–6	An appropriate scenario for investigation for an identified client, providing evidence of consultation, is described. The rationale for choosing the proposed product is justified and includes a range of appropriate criteria for evaluating the success of the product.

The client consultation, with explicit evidence in appendix, must inform the student's discussion of the scenario. This discussion must include a specific and explicit reference to the content of the consultation. A clear rationale must be offered both for the product and the software used to create the product, typically by considering alternatives. The criteria for success must be substantial, specific and testable.

Assessment should be based **only** on the material present in this section (or **referenced** to an appendix, e.g. an interview with the client; unreferenced appendices should not be credited).

Required components:

- A client identified, preferably by name but generic identifications ('the coach') should be accepted on benefit of doubt.
  In case the student is the client, this should be clearly stated.
  There is no requirement to identify the adviser, but in case the student is the client and no adviser has been identified, then this may be penalized in the "Evidence of consultation".

- Evidence of consultation – either with client or adviser
  Evidence must be explicit (for example an interview in appendix) and referred to.

- A rationale for choosing the **product** as well as for choosing the software.
  To be awarded top marks for this criterion, the software chosen for the product should also be justified. Explanations for choosing software must be product-related (e.g. ***not*** *"I already have it installed on my computer"). A solution which does not explain choices of software can only be awarded a maximum of 5.*

- Criteria for success
  Appropriate criteria are specific enough to help evaluate the final product.
  Generic criteria will lose marks in criteria A, B, D (functionality) and E.
  A range is indicated as a ***variety*** *of* ***appropriate*** *criteria.*

The components are not equally weighted, but rather judged holistically. The complete omission of one of the requirements (e.g. evidence of consultation), should only be penalized by dropping one level descriptor ("best-fit" approach).
Consultation – if useful evidence is included in the appendix and the described scenario aligns **strongly** with the content of a meaningful consultation then a direct quote or reference is not required.

Criterion B: Solution overview (6 marks)

- The student must provide a record of tasks and a design overview that includes an outline test plan.
- The *Record of tasks* form must be used.
- The record of tasks and design overview must refer to the product proposed in criterion A.

Marks	Description
0	The response does not reach a standard described by the descriptors below.
1–2	The record of tasks and the design overview, including an outline test plan, are limited. From this information it is difficult to see how the product was developed.
3–4	The record of tasks and the design overview, including an outline test plan, are partially complete. They provide a basic understanding of how the product was developed.
5–6	The record of tasks and the design overview, including an outline test plan, are detailed and complete. From this information it is clear how the product was developed.

Assessment should be based **only** on the material present in this section, evidence presented in appendices or under criterion C should be disregarded even when referenced.

Required components:

- A record of tasks (as presented in *forms.zip*)
  For completeness this record should include all 5 stages: plan, design, develop, test and implement (implement means using/testing the product as a solution).
- Design overview
  For completeness this overview should include: overall structure, internal structures and descriptions of specific elements, such as layout design, query design, non-standard algorithms, data structures (page 83 of the guide).
- Outline test plan *(as part of the design overview)*
  For completeness this plan must address the criteria for success as stated in criterion A.

The components are not equally weighted, but rather judged holistically.

If there is no *Record of Tasks* form **OR** no *design overview* then award 0 marks for criterion B.

If the Design overview only includes layout designs then marks will be limited to the lowest band.

Failure to use the correct *Record of Tasks* form (from forms.zip) will make the RoT 'limited' in terms of the criteria.

If there is no test plan the design overview is considered “partially complete”, and a maximum of 4 may be awarded in this criteria.

Please be aware that screenshots or code fragments from the final product have no place in design. Those elements should be disregarded … **unless** the student explicitly states that it is a prototype. In which case, the prototype should be evaluated and improvements indicated in criterion B.

Criterion C: Development (12 marks)

- The student must identify techniques used in developing the product.
- The student must explain the techniques, with screenshots, that were used to develop the product identified in criterion A, explaining why they have been used and why they are adequate for the task.

Marks	Description
0	The response does not reach a standard described by the descriptors below.
1–4	The use of techniques demonstrates a low level of complexity and ingenuity or does not address the scenario identified in criterion A. It is characterized by limited use of existing tools. There is no explanation of why the techniques are used or how they are adequate for the task. Sources are used but are not identified.
5–8	The use of techniques demonstrates a moderate level of complexity and ingenuity in addressing the scenario identified in criterion A. It is characterized by some appropriate use of existing tools. There is some attempt to explain the techniques used and why they are adequate for the task. All sources are identified.
9–12	The use of techniques demonstrates a high level of complexity and ingenuity in addressing the scenario identified in criterion A. It is characterized by the appropriate use of existing tools. The techniques are adequate for the task and their use is explained. All sources are identified.

This criterion provides students with the opportunity to show their knowledge and understanding of tools and techniques, which must be explained alongside visual evidence in the form of screenshots in order to fulfil the intention of this criterion. Similarly, there must be explicit evidence of algorithmic thinking, individuality and creativity in the form of explanations and code excerpts.

Assessment of this criterion should be based on evidence present in this section, supported by the video and appropriate appendices, like a code listing.

Statements from the Computer Science guide:

On page 84 the guide states:

(1) "Criterion C is a holistic assessment of the final product and assesses the student's understanding of the concepts involved in its development."

On page 83 the guide states:

(2) "The product **must** be compatible with the information in criterion A and criterion B."
(3) "The student **must** present a list of the techniques used in developing the product."
(4) "The student **must** provide evidence of algorithmic thinking."
(5) "... the development documentation **must** provide a detailed account ..."
(6) "Any reference material [...] **must** be acknowledged in this criterion.

Criterion C **Development** states:

(7) "The student **must** identify techniques used in developing the product."
(8) "The student **must** explain the techniques"

Moderation guidance for criterion C:

In the exceptional case that the product is not compatible with the scenario and/or design (criteria A and B) then 0 marks should be awarded *(statement 2)*

Otherwise, use the table below to judge ***Ingenuity*** and ***Complexity*** holistically *(statement 1)* based on the video and the design, keeping in mind that techniques are considered to be complex in terms of the SL Computer Science course.

		Complexity (at SL)		
Ingenuity		High	Moderate	Low
	High	9-12	7-10	5-8
	Moderate	7-10	5-8	3-6
	Low	5-8	3-6	1-4

This table indicates for each combination of Ingenuity vs Complexity the proper Mark Range. When in doubt, please use an averaged Mark Range. For example, a project is of moderate Complexity and the Ingenuity is somewhere between low and moderate, then use an averaged Mark Range of 4-7.

In order to emphasize the need for the student to
> document the development and to explain the use of techniques *(statements 5 and 8)*
> show evidence of algorithmic thinking, individuality and creativity *(statement 4)*
the holistic Mark Range from the table needs to be extended by 2 marks at the bottom end. For example, a Range of 8-11 becomes an Extended Range of 6-11.

The final mark within the (6 mark) Extended Range is then judged by:

- completeness of the listed techniques *(statement 3 and 7)*
- completeness of evidence of algorithmic thinking *(statement 4)*
- completeness and detail of development documentation *(statement 5)*
- quality of explanations provided including screenshots *(statement 8)*
- inclusion of references where appropriate *(statement 6)*

Criterion D: Functionality and extensibility of product (4 marks)

This criterion assesses the extent to which the product:

- functions, as evidenced in the video
- can be expanded and modified by future users as evidenced in the design and development documentation.

Marks	Description
0	The response does not reach a standard described by the descriptors below.
1–2	The video shows that the product functions partially. Some expansion and modification of the product is possible but difficult.
3–4	The video shows that the product functions well. Some expansion and modifications of the product are straightforward.

Assessment should be based on the video (for **Functionality**) and evidence in criteria B, C and appendix (for **Extensibility**); there is no requirement for the moderator to run the product.

There is no requirement for a separate written section for this criterion. If the student does provide a written section this should be assessed, but will also be included in their word count.

Required component:

- A video
  Evidence that the solution functions properly, fulfilling the success criteria from criterion A.
  *Accept **minor** omissions in functionality.*
  The quality of the video itself is not assessed.

  Note that the video should not document the development process, nor should it try to evidence extensibility. This would make the video too long and a reminder should be included in the feedback to schools that the video should only show evidence of functionality.
  The screen cast should be scripted to show comprehensive testing with specific reference to the Criteria for Success as listed in criterion A.

Functionality

In order to show evidence of full Functionality, the video must

- address all Criteria for Success (as listed in criterion A),
- use sufficient test data
- show evidence of changes made to data structures and/or files

Ultimately, no video submitted limits marks awarded to the 0-2 mark bands.
Note: the quality of the product is not assessed in this criterion – a lack of quality should have impacted criteria B and C.

Extensibility

Extensibility is **ONLY** based on level of detail and clarity shown in the Design and Development stage and the presence and documentation of any code involved (for example a code listing in the appendix). Without any code, there is limited scope for extending the product (equally true for web design, databases, spreadsheets, etc).
Full marks cannot be awarded for Extensibility if the detail in B or C is lacking and/or if an annotated code listing is not included in the appendix (in the case of a coded solution).

Criterion E: Evaluation (6 marks)

- The student must evaluate the effectiveness of the product based on feedback from the client/adviser. This must include direct references to the success criteria identified in criterion A.
- The student must recommend proposals for the future improvement of the product.

Marks	Description
0	The response does not reach a standard described by the descriptors below.
1–2	There is a limited attempt to evaluate the product against the success criteria identified in criterion A. There is limited evidence of feedback from the client/adviser and any recommendations for further improvement are trivial or unrealistic.
3–4	The product is partially evaluated against the success criteria identified in criterion A including feedback from the client/adviser. Recommendations for further improvement of the product are largely realistic.
5–6	The product is fully evaluated against the success criteria identified in criterion A including feedback from the client/adviser. Recommendations for further improvement of the product are realistic.

The students must do a full evaluation after implementing the product and it being used by the client, addressing all the criteria for success and including a full discussion of the product with reference to substantial and explicit client feedback, which must be included in an appendix.

Required components:

- An evaluation of the solution
  Full evaluation refers to addressing all the criteria for success and including a full discussion with reference to the client feedback.
- Feedback from client/adviser
  Evidence should be explicit (for example a questionnaire in appendix) and referred to in the evaluation.
- Recommendations for improvement
  At least 2 recommendations (not including the successful implementation of failed criteria for success).
  Do not judge the quality of the recommendations – just whether they are realistic. Recommendations may be generated by the client, but it is up to the student to include and justify those recommendations that are realistic.

Note: Client feedback is required only for the evaluation part, not for the recommendations. A reference to the client feedback in only recommendations does **not** count towards proper product evaluation.

The components are not equally weighted, but rather judged holistically. The complete omission of one of the requirements (e.g. evidence of consultation), should only be penalised by dropping one level descriptor ("best-fit" approach).

Follow up questionnaires (etc.) may be included in the appendices, but moderators should not award marks for appendices. The students should explicitly mention key parts of the client feedback in their evaluation, section E, if they are to be given credit (eg. "From appendix B, it is clear that Mr Smith could add, search, edit and delete items, however sorting did not work properly").

Note – We should expect a **detailed** evaluation including a **discussion** of significant client feedback (not just whether or not success criteria were achieved), plus **justification** of recommendations. The exemplars in the original teacher support materials (TSM) have perhaps been generously awarded in this area. However the new TSM and workshop projects have been marked more strictly.