# Digital Solutions 2019 v1.2

## IA3 assessment instrument

### Project - folio (25%)

#### Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. recognise and describe key elements of an application, components of data exchange systems, and data security processes

2. symbolise and explain data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data

3. analyse a data exchange problem and information related to data security

4. determine data exchange system requirements, a security strategy for data, and prescribed and self-determined criteria

5. synthesise information and ideas to determine selected data, algorithms and coded components of data exchange solutions

6. generate components of the data exchange solution

7. evaluate impacts, coded components and a data exchange solution against prescribed and self-determined criteria to make refinements and justified recommendations

8. make decisions about and use mode-appropriate features, written language and conventions for a technical audience.

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| **Subject** | Digital Solutions | **Instrument no.** | IA3 |
| **Technique** | Project – folio | | |
| **Unit** | Unit 4: Digital impacts | | |
| **Topics** | Topic 1: Digital methods for exchanging data  Topic 2: Complex digital data exchange problems and solution requirements  Topic 3: Prototype digital data exchanges | | |
| **Conditions** | | | |
| **Duration** | Up to 6 weeks | | |
| **Mode** | Multimodal | **Length** | Length:   * 6-8 A3 pages * 1-2 A4 pages of code with annotations * 1-2 minute demonstration of the functionality of the data exchange solution by video recording |
| **Individual / group** | Individual | **Other** | * The reference list and appendixes are not included in the page count. * Schools implement authentication strategies that reflect QCAA guidelines. |
| **Resources available** | * Computers * Internet * Stimulus (technical specifications) | | |
| **Context** | | | |
| We live in a connected world that is increasingly embracing technologies, which enable real-time data to be collected and exchanged across interconnected devices and systems. Understanding and developing methods of securing data exchange between computer systems is extremely important for privacy.  Federal, state and local government departments across Australia are adopting open data policies and increasingly provide access to, and encourage use of, open (publicly accessible) datasets. Open datasets, wearable technology, telemetry, smart homes, augmented and virtual reality, and sensors are being used across a variety of sectors to continuously monitor and track data and human activity.  Governments encourage use of open datasets through competitions known as GovHacks, which involve developing innovative solutions that solve problems and create better outcomes for local communities. Small teams are formed and given access to thousands of open datasets, which they then ‘mash’ together to create web, mobile or augmented reality applications, as well as 3D printed visualisations. Each team creates a project page, proof of concept and a video explaining how the government data can be used.  Brisbane City Council, for example, has an open data portal that is accessible to the public, which contains data on people of all ages. | | | |
| **Task** | | | |
| Read the technical specifications (stimulus material) and then present a proof of concept for a new web application for young people. The new web application must provide:   * Local residents with a platform to share comments, photos and connect with friends * Localised information about upcoming events, as well as traffic conditions.   Document use of the Digital Solutions problem-solving process in responding to the problem and generate a component of the data exchange solution.  The technical specifications provide further details about requirements for the new web application. | | | |
| **To complete this task, you must:** | | | |
| **Part 1 – Research and investigation**   * recognise and describe key elements of   + a data exchange application   + components of data exchange systems   + data security processes * symbolise using mind maps and one or more of constructed sketches, annotated diagrams, images or screenshots * explain   + data interface, data structures and data specifications   + digital methods of exchanging data * analyse the data exchange problem to identify   + the data structures, including data input and output requirements   + data exchange methods * determine data exchange system requirements * evaluate against prescribed and self-determined criteria the most suitable process for exporting and importing data between the two digital systems.   **Part 2 – Data exchange solution**   * symbolise using mind maps and one or more of constructed sketches, annotated diagrams, images or screenshots * explain   + data flow relationships within and between systems   + programming features and ideas using annotated code segments   + algorithms communicated in pseudocode * determine prescribed and self-determined criteria * synthesise data, algorithm and coded component ideas to generate a data exchange solution that stimulates the exchange of data between two digital systems; the solution will receive data in one format and programmatically transform it into another format for sharing/displaying * evaluate the   + accuracy of code after testing and identify errors and actions to make improvements   + digital data exchange solution against prescribed and self-determined criteria   + functionality, useability and efficiency of the components of the digital solution * make refinements and justified recommendations for current and future improvements.   **Part 3 – Impacts**   * recognise and describe key elements of   + risks associated with storing and accessing data   + digital security strategies, including authentication and encryption strategies * analyse a data security problem to identify risks to   + the system   + data security and privacy * determine a security strategy for data * evaluate against prescribed and self-determined criteria the impact of data transmission on personal, social and economic needs * recommend an appropriate strategy to increase data security. | | | |
| **Stimulus** | | | |
| See Technical specifications | | | |
| **Checkpoints** | | | |
| □ Term 3 Week 2: Submit data requirements, identification of algorithms and some code and user interface | | | |
| □ Term 3 Week 4: Complete draft submission | | | |
| □ Term 3 Week 6: Final submission | | | |

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| **Criterion** | **Marks allocated** | **Result** |
| **Retrieving and comprehending**  Assessment objectives 1, 2 | 6 |  |
| **Analysing**  Assessment objectives 3, 4 | 7 |  |
| **Synthesising and evaluating**  Assessment objectives 5, 6, 7 | 8 |  |
| **Communicating**  Assessment objective 8 | 4 |  |
| **Total** | 25 |  |
| **Authentication strategies** | | |
| * Students will provide documentation of their progress at indicated checkpoints. | | |
| * Students must acknowledge all sources. | | |
| * Students must submit a declaration of authenticity. | | |
| * The teacher will collect copies of the student response and monitor at key junctures. | | |
| * The teacher will conduct interviews or consultations with each student as they develop the response. | | |
| **Scaffolding** | | |
| Your response must include:   * headings that organise and communicate the iterative phases of the Digital Solutions problem-solving process * source referencing, using the school’s in-text referencing style * four A3 pages presenting research and investigations, including sample code on one A4 page (Part 1 — Research and investigation) * three A3 pages presenting the web application, including sample code on one A4 page (Part 2 — Data exchange solution) * one A3 page on impacts (Part 3 — Impacts). | | |

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# Stimulus

## Technical specifications

### Identification

Brisbane City Council runs a range of classes, workshops, activities and events in Brisbane. These events are dynamically listed on the What’s On experience of the Brisbane City Council website and can be accessed via live feed. Sometimes, when an event can attract a large crowd, accessing traffic and road condition information can be useful to assist residents in planning their outings.

A proof of concept is required to demonstrate the planning and data transfer functionality of a new web application for local Brisbane residents. A new web application for Brisbane residents will allow them to:

* connect with other registered residents
* use API datasets (QLD Traffic and Brisbane City Council Events)
* upload a geotagged photo of the attended event, and ‘tag’ fellow registered residents who may also be part of / associated with the photo, for their viewing leisure
* incorporate a ‘comment post’ system that allows a registered resident to post comments on site content (whether it be an event or traffic conditions)

The proof of concept involves:

* developing a low-fidelity prototype of the web application for local residents
* generating the data exchange component that simulates exchange of data between two digital systems (data server and web application). The solution will receive data in one format and programmatically transform it into another format for sharing and displaying
* evaluating impacts and making recommendations for improving data security during transfer
* developing a video to demonstrate data transfer functionality.

### Interactions

Proto-personas have been developed for potential users of the web application (see Figure 1 below).

###### Figure 1: User profiles for the new web application

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| --- | --- |
|  | Costas   * Lives in West End right near the city * Doesn’t drive, but congestion affects his area, as parking is restricted. * Has a strong interest in cultural events and markets. * Likes keeping in touch with his close friends, including his extended overseas family. |
|  | Freya   * University student studying engineering * Very science and mathematics oriented, and keen on arts events, as well as concerts and music events * Mostly uses public transport and cycles, although occasionally car pools with her university colleagues (for lectures) * Has a very large network of friends from her University and Queensland schooling. |
|  | Wayne   * Wayne is 18 years old and works full time. * He is heavily into the music scene, and loves night-time events. * He likes to take “selfies” and post them online, where his mates like to engage in “banter”, which has been filtered in the past. * Wayne drives his Toyota Supra sports car everywhere – it is his pride and joy. He doesn’t use public transport, or cycling. |

### Component Specifications

#### Data

The new web application must:

* incorporate dynamic event data
  + provide dynamic data feeds of up-to-date events and resource information
  + use publicly available web API datasets from
    - Upcoming Brisbane City Council Events  
      <https://www.data.brisbane.qld.gov.au/data/dataset/brisbane-city-council-events>
    - Queensland Traffic  
      <https://qldtraffic.qld.gov.au/more/Developers-and-Data/index.html>
  + enable users to view information.

The web application must:

* connect to each API dataset
* receive data in one format and programmatically transform it into another format and display the data
* display the contents of each dataset on
  + the same webpage (where specified below)
  + separate pages (where specified below)
* include relevant headings for each column of data
* display only the following data from the Upcoming Brisbane City Council Events
  + Event summary information
  + Location, start time, end time, and date
  + More information web link
  + Render any supplied image links as an image element on-screen
* display only the following data for the Queensland Traffic API
  + Information or description of feature, road summary and postcode
  + Duration of impact
  + Delay information (if any)
* Note:
  + The Upcoming Brisbane City Council Events is provided free via external service Trumba without need for an API key.
  + The Queensland Traffic API supplies a public API key that is limited to 100 requests per minute: "3e83add325cbb69ac4d8e5bf433d770b"

#### User interface / experience

The new web application must:

* be accessible on personal computers and mobile devices, though different web browsers
* allow users to customize their:
  + profile picture
  + personal details (username, suburb, email or phone)
* allow user to customize and access a quick list of their own followed or interested events or traffic conditions, taken from the datasets provided
* allow the user to take a geotagged photo, upload it and share it with other registered users
* allow users to comment on particular events, photos or traffic conditions (these posts will be stored for later access).
* feature a responsive web interface.

#### Code

The new web application must include:

* an algorithm to retrieve and display the data from each API
* code to retrieve data from the API
* code accuracy
  + data from each API will be displayed on the same webpage on the users customised ‘quick link list’
  + data from each API can be displayed separately, for example in an individual category page
  + the web application needs to
    - use the two stated datasets
    - connect to each dataset
    - display only the stated data
    - include column headings for the data
* efficient code.

### References

* Brisbane City Council 2018, ‘Whats-On’, <https://www.brisbane.qld.gov.au/whats-on>
* Brisbane City Council 2018, Live Event Feeds, <https://www.data.brisbane.qld.gov.au/data/dataset/brisbane-city-council-events>
* Department of Transport and Main Roads 2018, Developers and data, <https://qldtraffic.qld.gov.au/more/Developers-and-Data/index.html>
* Queensland Government 2016, Queensland Traffic API Specification, <https://qldtraffic.qld.gov.au/media/more/qldtraffic-website-api-specification-V1-1.pdf>

Instrument-specific marking guide

Criterion: Retrieving and comprehending

### Assessment objectives

1. recognise and describe key elements of an application, components of data exchange systems, and data security processes

2. symbolise and explain data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data

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| **The student work has the following characteristics:** | **Marks** |
| * accurate and discriminating recognition and discerning description of key elements of an application, components of data exchange systems, and data security processes * adept symbolisation and discerning explanation of data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data. | 5-6 |
| * appropriate recognition and description of key elements of an application, components of data exchange systems, and data security processes * competent symbolisation and appropriate explanation of data interface, structures and specifications; data flow relationships within and between systems; and digital methods of exchanging data. | 3-4 |
| * variable recognition and superficial description of elements of an application, components of data exchange systems, or data security processes * variable symbolisation and superficial explanation of aspects of data interface, data flow relationships or digital methods of exchanging data. | 1-2 |
| * does not satisfy any of the descriptors above. | 0 |

Criterion: Analysing

### Assessment objectives

3. analyse a data exchange problem and information related to data security

4. determine data exchange system requirements, a security strategy for data, and prescribed and self-determined criteria

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| **The student work has the following characteristics:** | **Marks** |
| * insightful analysis of the data exchange problem and relevant information related to data security to identify the data structures, data exchange methods, risks to data and code components * astute determination of data exchange requirements, security strategy for data, code for the data conversion program and essential prescribed and self-determined criteria. | 6-7 |
| * considered analysis of the data exchange problem and relevant information related to data security to identify the data structures, data exchange methods, risks to data and code components * logical determination of data exchange requirements, security strategy for data, code for the data conversion program and effective prescribed and self-determined criteria. | 4-5 |
| * appropriate analysis of the data exchange problem and information related to data security to identify the data structures, data exchange methods, risks to data and code components * reasonable determination of data exchange requirements, security strategy for data or code for the data conversion program and some criteria. | 2-3 |
| * makes statements about aspects of the data exchange problem, data structures, data exchange methods, risks to data or code components * vague determination of some data exchange requirements, security strategy for data and some criteria. | 1 |
| * does not satisfy any of the descriptors above. | 0 |

Criterion: Synthesising and evaluating

### Assessment objectives

5. synthesise information and ideas to determine selected data, algorithms and coded components of data exchange solutions

6. generate components of the data exchange solution

7. evaluate impacts, coded components and a data exchange solution against prescribed and self-determined criteria to make refinements and justified recommendations

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| **The student work has the following characteristics:** | **Marks** |
| * coherent and logical synthesis of relevant information and ideas to determine selected data, algorithms and coded components of data exchange solutions * purposeful generation of efficient components of the data exchange solution * critical evaluation of impacts, coded components and a data exchange solution against essential prescribed and self-determined criteria to make discerning refinements of code and astute recommendations justified by data. | 7-8 |
| * logical synthesis of relevant information and ideas to determine data, algorithms and coded components of data exchange solutions * effective generation of components of a data exchange solution * reasoned evaluation of impacts, coded components and the digital data exchange solution against effective criteria to make effective refinements of code and considered recommendations justified by data. | 5-6 |
| * simple synthesis of information or ideas to determine data, algorithms and coded components of data exchange solutions * adequate generation of components of the data exchange solution * feasible evaluation of impacts, coded components and a digital data exchange solution against some criteria to make adequate refinements of code and fundamental recommendations justified by data. | 3-4 |
| * unclear combinations of information or ideas to determine data, algorithms or coded components of data exchange solutions * superficial evaluation of impacts, or the digital data exchange solution, against criteria. | 1-2 |
| * does not satisfy any of the descriptors above. | 0 |

Criterion: Communicating

### Assessment objectives

8. make decisions about and use mode-appropriate features, written language and conventions for a technical audience

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| **The student work has the following characteristics:** | **Marks** |
| * discerning decision-making about, and fluent use of   + written and visual features to communicate about a solution   + language for a technical audience   + grammatically accurate language structures   + referencing and project conventions. | 3-4 |
| * variable decision-making about, and inconsistent use of   + written and visual features   + suitable language   + grammar and language structures   + referencing or project conventions. | 1-2 |
| * does not satisfy any of the descriptors above. | 0 |