

PROJECT REPORT

The cost of IT downtime



Universities and Colleges
Information Systems Association

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Executive summary

The move towards 24/7 operation and service delivery and increased dependency on IT to deliver all aspects of a higher education institution's (HEI) business has resulted in a significant investment in technological solutions to deliver increased systems resilience and business continuity. This investment has often been made without a full business case being established. UCISA commissioned Jermyn Consulting to examine the financial impacts on higher education institutions (HEIs) of prolonged disruption to IT services. The project was funded through a grant awarded under the Higher Education Funding Council for England's (HEFCE) Leadership, Management and Governance Fund. The study used a base scenario which considered the disruption of all central IT services for a five day period and used further scenarios to consider the loss of certain core services in isolation (virtual learning environment, email and research management systems), and to consider additional or increased impacts during specific periods (admissions, clearing, enrolment and results).

Data was gathered in three stages:

- Filtering: UCISA member HEIs in the UK were asked to complete a questionnaire regarding their IT resilience and experience of IT disruptions;
- Focus groups: Five UCISA member HEIs attended a workshop to establish the impacts specific to them. Where possible, this was supported by a further executive meeting to develop understanding of those impacts;
- Modelling: Two UCISA member HEIs were interviewed to validate impacts and understand how they could be estimated.

The financial impacts were divided into three different categories:

- Loss of income;
- Increased costs;
- Contingent liabilities and intangible costs.

Each of these categories of impact were relevant at all focus group and modelling HEIs. Jermyn Consulting worked with HEI respondents to establish individual impacts and to understand how they would manifest over time.

Following analysis of the data, it was determined that loss of income and increased costs due to IT disruption can be approximated reasonably accurately by HEIs. However, contingent liabilities and intangible costs cannot be practically calculated, due to the many variables involved.

This report outlines a methodology that should allow institutions to calculate the cost of IT disruption and so make better informed decisions on systems resilience, continuity arrangements and insurance.

1 Introduction

1.1 Overview

The Project goal was to examine the financial impacts upon HEIs when:

- All central IT services are unavailable (this was the base scenario);
- Specific IT services are unavailable;
- All central IT services are unavailable in specific selected scenarios.

During the course of the study, data was gathered through online questionnaires, focus groups and detailed modelling sessions. The data was then consolidated and analysed, to inform the findings set out in this report.

1.2 The issue

IT services support the core activities of modern HEIs. The requirements of HEI user groups are diverse and their IT usage varies broadly. IT users expect to have continual access to IT services during the day; but with a large contingent of international, remote and out of hours users, many HEIs provide IT service on a 24 hour basis.

HEI investment in IT systems resilience, business continuity procedures and insurance to deliver and protect the core IT services is often not supported by a quantifiable business case. UCISA has identified a need within the HE sector to create a toolkit which will allow HEIs to measure the loss of IT services in financial terms over the immediate, medium and long terms. The toolkit would be used to assist in the development of a quantifiable business case.

This report highlights the methodology derived; the report is considered thorough enough that it is not considered necessary to produce a separate toolkit.

1.3 Objectives

The objectives of the project were:

- To identify all relevant costs (direct, indirect and contingent) as well as other risks that are not immediately quantifiable (reputation, compliance and legislation);
- To develop workable formulae for use by HEIs in determining a business case for investment in resilience;
- To engage key and senior stakeholders in sample HEIs, maximising the use of their time;
- To engage as many HEIs as possible in the study;
- To identify and disseminate best practice in the sector.

1.4 Method

The following methodology was used to deliver the study:

■ Filtering

An online questionnaire was forwarded to UCISA, AHUA and BUFDG representatives, as agreed with the project board. The questionnaire was used to identify any previous impact assessments, past IT service failures and to gather additional relevant data. The questionnaire collected data from a broad range of HEIs in England, Scotland and Wales.

■ Sampling

A representative sample of institutions was selected from those institutions that had responded to the survey. Criteria included HEI size, student intake, level of academic research and location. Questionnaire responses were analysed to determine candidate HEIs for the focus group and modelling stage.

Not all candidate HEIs selected during sampling were available for the focus group and modelling stages. It was planned to collect further data from six UK wide HEIs (including one in Scotland and one in Wales). Since this was not possible, data was collected from five HEIs in England. We do not believe that this undermines the overall result of the project. However, we cannot comment on possible local issues for HEIs in Scotland and Wales.

■ Focus groups

Focus groups consisted of a broad range of HEI management stakeholders, to identify as many impacts as possible. Attendees were asked to consider complete loss of IT service for a period of five days during a typical HEI day (i.e. not during peak activity). Further questions were asked about:

- How impacts differed during admissions, clearing, enrolment and results.
- The specific impacts for loss of the following IT services: email, virtual learning environment and research management systems.

The focus groups comprised a two stage process. The first stage involved data gathering workshops with representatives from the HEIs IT, finance and user community. The second stage in the process comprised data verification and clarification workshops or interviews with senior and executive management from IT and finance departments.

■ Test modelling

Two HEIs that had not participated in the focus group stage were selected to validate and refine the findings of the focus group stage.

■ Data analysis and reporting

Following completion of the test modelling work, Jermyn Consulting carried out analysis of the data which identified all relevant issues, allowed conclusions to be drawn and allowed the development of appropriate assessment procedures for HEIs to calculate costs. The findings of the data analysis are set out in this report.

1.5 Scope

The scope of the study consisted of:

Filtering

36 UCISA HEIs completed the survey and a further nine partially completed it. All are listed in Appendix 2.

Focus group institutions

London South Bank University

Loughborough University

University of Bradford

University of Nottingham

University of Reading

Test modelling institutions

Leeds Metropolitan University

University of Sheffield

1.6 Assumptions

In preparing this report, the following assumptions have been made:

- That the HEIs selected to be in scope provide a reasonable overview of HEI requirements in the UK. Note that while the project plan included six UK HEIs at the focus group stage (including one from Scotland and one from Wales), only five HEIs in England participated at this stage;
- That appropriate individuals represented each HEI at the filtering, focus group and modelling stages;
- That HEI representatives provided carefully considered information on the impacts of IT service loss.

2 Data gathering

2.1 Filtering and sampling

The sector was surveyed to establish the level and causes of IT failure. Appendix 1 details the questions and Appendix 2 lists the responses.

Observations

- HEIs have developed diverse structures of IT provision. All have a central IT support function, but many devolve a level of responsibility for local IT provision to academic areas;
- A significant number of respondent HEIs have suffered IT service outages in the last five years:
 - 42% have suffered a single IT service outage for a period longer than 24 hours;
 - 39% have suffered a multiple IT service outage for a period less than 24 hours;
 - 42% have suffered a multiple IT service outage for a period longer than 24 hours.

However, only one HEI has completed an assessment of the cost of IT downtime in the last five years. The HEI in question has suffered all three forms of outage above, having suffered a multiple IT service outage for longer than 24 hours, on three occasions.

The responses from the questionnaire were used to identify a list of six HEIs to proceed with the focus group stage. However, not all candidate HEIs were available to continue the study. As such, the focus group stage was carried out with five HEIs based in England.

2.2 Focus groups

The purpose of focus groups was to understand the nature and extent of potential impacts upon HEIs if IT services were disrupted. It was apparent from the filtering work that HEIs have different IT resilience and disaster recovery capabilities, and differing experience of IT service outages. If focus groups were asked to record impacts based on these differing capabilities and experiences, it would not be possible to gather comparable data for analysis and consolidation. As such, all focus groups were asked to assume the IT service outage was total, and that it would be restored in five working days, regardless of their actual capability. Also, the focus groups were asked to avoid focusing on reasons for an IT outage, but rather the impacts upon the HEI.

Jermyn Consulting facilitated the focus groups by using a workshop format at each HEI. The convenor of the meeting (in most cases the UCISA representative) assembled key personnel to answer impact questions. Attendees were asked to consider financial impacts in three categories:

- Loss of income;
- Increased costs;
- Contingent liabilities and intangible costs.

Workshops were divided into three stages:

2.2.1 Information gathering and impact assessment

At this stage the focus group:

- Listed potential impacts;
- Sorted potential impacts into categories;
- Removed duplicate impacts.

For each impact it was agreed:

How soon the impact would be felt by the HEI (in days, weeks, months or years);

- If the impact would reoccur (this is important, as in some cases the impact is not a single event, but is repeated);
- The time of year the impact would occur.

2.2.2 Impact assessment based on scenarios

Each impact was revisited to establish whether it increased or reduced during the following scenarios:

- Admissions, clearing, enrolment and results;
- Loss of the following IT services in isolation: email, virtual learning environment, research management systems.

2.2.3 Magnitude

The financial representative present determined the magnitude of financial loss for each impact. This was based on the scale:

- High (would be recorded as an extraordinary item in the accounts);
- Medium (would be outside of the normal expenditure range for departments);
- Low (would be absorbed within department budgets).

As such, the financial loss of each impact was quantified according to the affect it would have on the HEI, rather than asking for an amount (in GBP pounds sterling). Participants were asked to associate financial figures to a scale of high, medium and low magnitude. This allows the impacts to be prioritised. The following magnitude scales were agreed with the Universities of Loughborough and Nottingham:

Loughborough University – financial magnitude scale	
High	£500,001 and above
Medium	£250,001 to £500,000
Low	£0 to £250,000

This was derived from the scales in the University risk register and agreed with Loughborough University focus group.

University of Nottingham – financial magnitude scale	
High	£2,000,001 and above
Medium	£250,001 to £2,000,000
Low	£0 to £250,000

This was agreed in an executive meeting with a senior member of Finance office staff in the University.

Observations

- A very wide range of impacts were identified across HEIs, although certain impacts manifested in each HEI. In addition, certain impacts are common across HEIs (e.g. involving student recruitment and enrolment) but occur at different times at different HEIs. However, there are certain events that occur at the same time across all HEIs, such as The Universities and Colleges Admissions Service (UCAS) results processing, clearing (where relevant) and participating in the Research Excellence Framework.
- Loss of single IT services (email, virtual learning environment or research management systems) had a far less significant impact than loss of all IT services. However, the impacts of loss of the virtual learning environment were less significant than the others. This was due to the pervasive nature of email, and the high magnitude research impacts caused by loss of research management systems.
- Loss of all IT services during a critical activity (admissions, clearing, enrolment and results) had a very different impact depending on the HEI. In particular, admissions and clearing differed due to the demand for places and extent to which clearing was used.
- The financial figures associated with high, medium and low magnitude differed between HEIs, according to the size and income of the HEI.

2.3 Analysis and modelling

The data gathered at the focus group stage was analysed and consolidated. Duplicate impacts were identified, reducing the 128 highlighted in the focus groups to 64. Following this, modelling meetings were held with finance representatives from each HEI in scope. The key components of modelling meetings were to:

- Confirm that the consolidated list of impacts were relevant to the HEI;
- Confirm if and when the impact would occur;
- Determine if the financial impact could be measured:
 - As a specific amount or;
 - As a percentage of a total or;
 - As a range.

Contingent liabilities and intangible costs were not reviewed as part of the modelling stage. This is due to the *follow on* nature of these impacts. For example, they are not an immediate outcome of the loss of IT service. As such they may not manifest if corrective action is taken by the HEI, which makes it difficult to quantify the potential financial loss.

Observations from the analysis and modelling stage are included in the Impact analysis (section 3).

3 Impact analysis

3.1 Overview

Appendix 4, 5 and 6 list the impacts derived from the focus groups output, used at the modelling stage. Each appendix relates to one of the three impact categories (loss of income, increased costs, contingent and intangible liabilities) sorted into high, medium and low magnitude (please see 2.2.3 for explanation of magnitude). Impacts are listed with three impact timeframe variables:

- When could it occur?

Would the financial impact occur if IT services were disrupted at *any* time during the year, or only during a *specific* period. Appendix 3 lists the time specific impacts with the months of the year associated with impact occurrence.

- How soon would it manifest?

How soon would the financial impact manifest (i.e. be incurred by the HEI) after the IT disruption? For example, the inability to submit research proposal submissions would not affect the HEI until payments under the contract would have become payable.

- Will impacts recur?

Will the financial impact recur in the future, as a direct result of the IT service failure. For example, the loss of (undergraduate) fees would affect the HEI for each of the following three years.

3.2 Loss of income

The majority of high and medium magnitude impacts are due to the effect on student recruitment and the loss of research contracts resulting from a major IT outage (see Appendix 4). The two exceptions are impacts to commercial income (*failure to deliver enterprise services* and *failure to deliver third party/commercial services*).

Almost all of the low magnitude impacts are due to loss of some form of operating income (for example, library fines, residences and point of sale). Many of these operating income impacts manifest much sooner than the student and research impacts. This is a reflection of the immediate nature of the impacted financial transactions.

HEI finance representatives confirmed that in some cases (such as property income and alumni donations), income could be deferred until IT services were restored. In addition, HEIs have a powerful control in place in that qualifications may be withheld by the HEI if there is any money owed by the student.

3.3 Increased costs

The only high magnitude increased cost is the funding body (e.g. HEFCE) financial penalty for the over recruitment of students (see Appendix 5). Other increased costs relate to loss of efficiency, the cost of manual workarounds and the cost of clearing the backlog of work once IT service is resumed.

The value of many of the increased costs depends on the action taken by the HEI after the IT disruption. While an IT disruption would cause increased workload (due to manual workarounds and clearing of backlog), this may not result in increased salary costs. Some personnel related impacts are near certainties, such as the requirement for additional security staff to guard entrances after the failure of electronic locking systems. However, professional service and academic staff may not have overtime arrangements in their employment contracts. Any special arrangement to pay overtime would be part of a HEIs incident response in dealing with the IT disruption and its affects.

3.4 Contingent liabilities and intangible costs

Of the three high magnitude contingent liabilities and increased costs (listed in Appendix 6), one is student recruitment related. These impacts are not inevitable, and the response of the HEI to the IT disruption may avoid them or reduce their magnitude.

3.5 Scenario specific impacts

Focus groups were asked to define potential impacts for the simultaneous loss of all IT services. They were also asked to define which impacts were relevant to admissions, clearing, enrolment and results, and how the base data changed as a consequence of the specific scenario. Scenarios were also factored into the data collection method, as respondents were asked to state months of the year that impacts would occur.

Results of this are listed in Appendix 7. Respondents suggested that the enrolment process could potentially be deferred a week or more if the IT disruption caused the process to stop. The results process would be more difficult to defer, due to the use of external examiners available for a specific timeframe, but this would need to be done. Admissions and clearing both present greater problems as they are time dependent processes.

Respondents were also asked to consider impacts of the following IT services in isolation: email, virtual learning environment, research management systems. Relevant impacts were identified and are listed in Appendix 7. The magnitude and effect of these impacts would be reduced as other IT services would still function in this scenario. This would greatly increase HEI options for workarounds.

4 Estimating potential impacts

4.1 Overview

It was concluded that calculations can be performed to derive approximate estimates for loss of income and for increased costs. These are described in section 4.2 and 4.3 as methods of calculation rather than as formulae.

Contingent liabilities and intangible costs are much more difficult to calculate as there are many more variables and potential outcomes:

- Steps can be taken by the HEI after the IT disruption to avoid contingent liabilities and intangible costs;
- External factors will affect the likelihood and magnitude of impact (such as the volume of UK applicants in a given year, or the extent of media coverage of the IT disruption).

As such, it is not recommended that HEIs attempt to calculate these.

Due to the changing nature of HEI activities throughout the year, the estimation should be performed for each calendar month (or in greater detail if required by the HEI) to achieve an annual view. Appendix 3 lists all impacts occurring at a specific time of year. However, this is derived from focus group and modelling data and may not represent the impact list or impact time periods for all HEIs.

4.2 Loss of income

- To estimate potential loss of income, the HEI should use the list of impacts in Appendix 4 to:
 - Determine the impact time period (month of the year);
 - Establish whether the impact is relevant to the HEI;
 - Establish if the impact is relevant to that time period;
 - Determine whether there are any HEI specific impacts that are not listed. If there are then they should be added;
 - Quantify the potential loss of income caused by the impact using information to hand (such as previous year's income for the same period, and income projections for the current year). It may be necessary to provide an approximation;
 - Classify impacts by magnitude as High (would be recorded as an extraordinary item in the accounts), Medium (would be outside of the normal expenditure range for departments) or Low (would be absorbed within department budgets);
 - Consider extending the calculation to a three year or five year period, to identify recurring loss of income;
 - Calculate the approximate extent to which the impact would be mitigated by manual workarounds. Adjust the loss of income caused by the impact and estimate the cost of providing the manual workaround;
 - Determine how soon the loss of income would be felt. This will provide a profile of future financial loss;
 - Determine the proportion of lost income that can be recovered at a later date (i.e. deferred or made payable by the student before graduation).

Total the potential loss of income for each time period to determine the time periods with the highest potential impacts.

- Total the recurring loss of income resulting from IT disruption in each time period.

4.3 Increased costs

To estimate potential increased costs, the HEI should use the list of impacts in Appendix 5 to:

- Determine the impact time period (month of the year);
- Establish whether the impact is relevant to the HEI;
- Establish if the impact is relevant to that time period;
- Determine whether there are any HEI specific impacts that are not listed. If there are then they should be added;
- Quantify the potential increased costs caused by the impact using information to hand (such as previous year's costs for the same period, and cost projections for the current year). It may be necessary to provide an approximation;
 - Classify impacts by magnitude as High (would be recorded as an extraordinary item in the accounts), Medium (would be outside of the normal expenditure range for departments) or Low (would be absorbed within department budgets);
 - In the case of overtime payments and temporary recruitment, consider if they are likely to be made for manual workarounds and the clearing of backlogs;
 - Extend the calculation to a three year or five year period (to align with the period used for loss of income), to identify recurring increased costs;
- Determine how soon the increased cost would be felt. This will provide a profile of future financial loss.

Total the potential increased costs for each time period to determine the time periods with the highest potential impacts.

- Total the recurring increased costs resulting from IT disruption in each time period.

4.4 Related risks and impacts

Financial impacts are only one component of the impacts that a HEI would experience as a result of an IT disruption:

- Operational disruption;
- Disruption to teaching;
- Disruption to research;
- Disruption to alignment with regulations and compliance;
- Any effect on reputation.

There may be indirect financial impacts resulting from these which are reflected as contingent liabilities and intangible costs. However, the immediate non-financial disruption should also be considered.

5 Conclusion and recommendations

5.1 Overview

HEIs can calculate the approximate financial loss of IT disruptions using the method in this study. However, this method assumes significant time and resource is available to perform the calculation. As such, it is recommended that the HEI performs two preliminary steps before undertaking a full calculation:

- Review impacts (conduct a preliminary study to understand impacts at the HEI);
- Perform the calculation, for high magnitude impacts only.

HEIs should consider their objectives before performing any calculation or further review of the data. This should provide the HEI with an indication of the appropriate level of investment in the calculation, and whether certain impacts require additional focus.

The steps recommended below were presented to and endorsed by representatives from Leeds Metropolitan University and the University of Sheffield.

5.2 Step 1 – Impact review

As a first step, HEIs should perform a review of their own impacts using the method described in section 2.2 of this report. In effect, the HEI will conduct its own focus group to identify impacts, when they occur, when they manifest, if they recur, and their magnitude. In addition, the HEI should use the modelling question in section 2.3 to determine how best each impact can be calculated (as an exact amount, percentage of a total, or as a range).

This will give the HEI a prioritised list of impacts with a financial magnitude attached, and an understanding of how difficult it will be to gather further financial impact data. This level of review optimises use of resource, and may contain sufficient detail for the HEI to develop resilience planning and investment.

5.3 Step 2 – Calculation of high magnitude impacts

Perform the calculation as described in section 4 but for high magnitude impacts only. This will provide the HEI with an indication of the most significant impacts to protect against, whilst avoiding considerable investment in the calculation.

5.4 Step 3 – Full calculation

Perform the full calculation as described in section 4. Increased focus on certain impacts may be required, depending on what the results will be used for.

5.4.1 IT service resilience investment

The full calculations described in sections 4.2 and 4.3 should be performed if the HEI is developing a business case for investment in IT service resilience.

Potential impacts from related contingent liabilities and intangible costs impacts should also be considered in developing IT service resilience, to avoid follow on impacts.

5.4.2 Process resilience investment

The full calculations described in sections 4.2 and 4.3 should be performed if the HEI is developing a business case for investment in process resilience (for example, to make clearing or enrolment resilient processes). Developing process resilience will require a combination of IT resilience and business continuity. This should ensure that the IT services and resources (such as staff, rooms, infrastructure) used by the process have planning in place in the event of IT disruption.

To focus on particular processes, the HEI should draw out the high magnitude impacts. In particular, the HEI should address processes which have set timeframes, such as UCAS admissions, clearing, elements of enrolment related to overseas students and the Research Excellence Framework.

Potential impacts from related contingent liabilities and intangible costs impacts should also be considered in developing process resilience, to avoid follow on impacts.

5.5 Building resilience in higher education

Defining the financial impacts of loss of IT services will assist HEIs in developing a business case for investment in IT resilience and IT disaster recovery. However, this is only one aspect of continuity planning and HEIs should adopt a balanced approach. This study focuses on IT service disruption, many other forms of disruption are possible (for example, pandemic virus causing resource issues).

Each HEI should have an effective major incident management plan for dealing with the cause of an IT service disruption (or any other major disruption). In addition, IT service continuity and business continuity arrangements should be in place to:

- Take all reasonable steps to avoid disruption to key activities (including IT disruption).
- Put in place recovery plans and arrangements for the recovery of key activities and the IT services supporting them.

Ultimately, HEIs should focus on making their processes resilient (which may often involve IT resilience), rather than focusing on IT resilience for its own sake.