

Academic Project Monitoring Using a Web-based System

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Abstract—Undergraduate and postgraduate students take part in project work designed with broad scopes. These projects encourage the student to showcase their abilities along with time and project management skills. Timescales for these types of projects are necessarily longer, meaning that keen supervision can be required to ensure efforts are appropriately applied. We present a web-based pedagogical tool and workflow to support effective monitoring of these students within the UK and Western European Higher Education systems. This workflow includes an oversight capability to handle the objections and unavoidable subjectivity that can arise. Ultimately, the process and tool are designed to aid in allowing the students to achieve their potential, improving success rates when measured against the learning outcomes. The authors believe that the tool and workflow are abstracted enough to be used in any project-based review process.

Index Terms—Student Progress, Monitoring Tool, Student Support

1 INTRODUCTION

SUPPORTING longer-term student projects can present new challenges to educators. The student is expected to maintain interest and effort over an extended period in addition to their usual study loads. The onus, quite rightly, is placed upon the student to manage their time and resources appropriately. Previous work [1] has already shown the multitude of benefits of attentive monitoring, ensuring every student reaches their potential. The rationale for such a process could be reduced to common sense: the earlier an instructor is aware of issues, the sooner they can intervene.

Each academic has developed a unique style and strategy for maintaining a watchful eye over their student projects. These practices are often separate from (often) centralized pastoral care systems. The process is often opaque and accountable to no-one [2], [3]. Only when a deliverable, be it the final product or a milestone, is submitted is any outside opinion solicited. With long-running projects (such as postgraduate research degrees, or final year dissertations), this can lead to wasted effort and upset on both sides of the supervisory relationship. With undergraduate projects, the scope for going awry is less but significant disagreements can still occur. (Most disagreement with undergraduate projects is between supervisor and second marker, rather than student and supervisor.)

This paper presents the following contributions:

- 1) An examination of the existing process and solutions in use in the UK and Western Europe.
- 2) A rationale and benefits of altering this process.
- 3) A web-based tool to support the improved monitoring process.

- 4) Two small-scale case studies, using both undergraduate and postgraduate students at Bangor University.
- 5) An evaluation proving efficacy to the research student project and wider applications where regular and repeated monitoring is required.

2 RELATED WORK

Most student monitoring systems are designed to measure the students' progress holistically within the scope of any given course. Some of these are web-based [4], [5], others traditional desktop applications [6], [7]. There are examples of systems developed to solve particular educational issues, such as teaching languages to allow access to more educational options [8]. Significant effort has already been spent on creating visualizations to track students' progress throughout their careers [9], [10], [11], [12], [13]. Almost all of these, however, are based on existing metrics and data available within an institution. They are primarily designed to find or emphasize patterns that are not immediately apparent to educators.

When dealing with student project work, there is a significant body of research stating that careful monitoring is required [14], [15], [16]. However, there are fewer mechanisms proposed to deal specifically with project work. There have been suggestions for on- and off-line systems [17], [18], however, these usually have an ulterior motive such as removing undesirable behavior traits or improvement in assessing group efforts.

Drummond and Boldyreff proposed an entirely virtual environment [19] to contain the project work. This approach allows monitoring and gathering of statistics on almost every interaction with the system. This concept certainly has merit but is not applicable in every situation. In the suggested deployment of their tool, programming, almost all work can be measured by the interactions and result. However, in research and when teaching abstract concepts,

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Manuscript received June 19, 2016.

the important detail is lost as the virtual environment cannot capture it. For example, the number of papers, websites or other electronic resources used could easily be recorded. It is not possible to track offline resources; nor whether the student read, or understood the material(s).

Research into similar systems, dubbed Intelligent Tutoring Systems, was in vogue during the late 1990s to mid-2000s. These systems attempted to emulate the response and adaptive qualities of live teachers [20], [21], [22]. While this form of a system may well be successful in courses with narrowly defined curricula; the range of responses required to handle project work is simply too vast to model in one of these systems. Another drawback to a fully automated/electronic system is that students can learn to game the system [23]. A corollary is where students apply a strategic learning style [24] to pass a module/test/examination. Without the 'human in the loop', this gaming can go unchecked. In a project context, the result is weakened oversight, and arguably more aspects that could go awry despite the application of technology and appropriate *reported* progress.

3 THE WESTERN EUROPEAN RESEARCH MONITORING PROCESS

This section most readily applies to Ph.D. and M.Sc. (Res) programs. There will be slight variations by institutional and subject. Elements can be transposed into undergraduate or taught M.Sc. theses.

Institutions in the UK and Western Europe share a similar annual, or semi-annual review process for monitoring progress and setting goals. We base this assertion on personal communications between the authors and academics from University of Cagliari, Italy; Delft University of Technology, Netherlands; Technical University of Sofia, Bulgaria. The United Kingdom perspective¹ comes from the authors' first-hand knowledge of the Bangor University process.

Each period, either semi-annually or annually as defined by local policy, the student is required to prepare a report detailing activities in that period. The prompts provided, on forms where used, are largely the same: 'what have you achieved?', 'what progress have you made?', 'what challenges have you faced?', and 'what is the plan for the next period?'. These questions suggest a reflective approach, more than a coldly analytic one. Once the report has been prepared, the student will meet formally with their supervisory committee. The student's immediate supervisor(s), any co-supervisors, and any other advisers assisting with the endeavor have a seat on this committee. The student may be asked to present their report orally, or it may take the form of a Q&A session.

After this meeting, the supervisory committee will prepare a written report detailing the student's performance

1. The substantive portions of the UK view are also corroborated by various policy documents, such as <http://www.ncl.ac.uk/fms/postgrad/documentation/documents/Resstudenthandbook2014-15.pdf> §4, <http://www.abdn.ac.uk/cops/graduate/assessment-process-255.php>, and <http://www.gcu.ac.uk/graduateschool/postgraduatestudy/phdstudyatgcu/researchstudentprogressionforms/>

and the committee's recommendation (progress, fail or downgrade to a lower qualification). After being agreed and signed by the members of the committee and the student, the report is submitted to the institution. The tone and tenor of this return could be colored (either way) by the relationship [2]. Most versions of the forms asked for an impression of progress but did not require evidence to be submitted to justify those perceptions. Therefore, no proof of a truly objective assessment of achievement or skill can be shown. As a result, the report could be prepared in a one-sided manner. If or when disagreements occur the student may feel they have little option than to avail themselves of the formal appeals process further fuelling a deterioration of the relationship.

4 BENEFITS OF REVISING THE MONITORING PROCESS

Any progress monitoring will necessarily include an element of evaluation, of the student and deliverables. It is natural in these situations that students feel some level of performance anxiety [25], [26]. Using an environment that is familiar to the student can help lessen that anxiety. Higher Education institutions routinely use Virtual Learning Environments (VLEs) such as Moodle, Blackboard Learn™ and similar. Utilizing these systems for assessment is not a new concept [27], [28], [29]. Rarely are such systems used for control or assessment of research and/or project activities. Such systems are used as a repository for marks and feedback to the student as well as for plagiarism detection. As more digital natives embark on their higher education careers, the use of technology will be far more accepted than ever before [30]. This familiarity may help lessen the anxiety associated with the progress review when students are compiling their responses.

In these longer term projects, academics tend toward using a report such as a dissertation or a thesis as the primary deliverable and use this for assessment. The thinking behind this choice is to incorporate transferable and communication skills into the evaluation of student performance. This practice is reasonable and filled with good intentions. It does mean, however, the assessment becomes entirely summative. The workflow and tool presented are not arguing to remove this form, but to supplement it with formal, regular and transparent monitoring meetings.

Any monitoring tool/process need not solely report students' progress; it can be another channel for feedback to benefit both sides of the relationship. A previous study spanning three years found that students do value their tutors' feedback but will only spend a limited time on it [31]. In a project setting this translates into requiring more, but smaller, 'chunks' of feedback to digest at regular intervals. A methodology using this suggestion can help support the existing supervisory process with plans and guidance at every stage. Research commissioned by the Higher Education Academy [32] highlights the necessity of feedback to nurture and encourage a partnership approach to release a student's potential. Chao [16] has found that electronic tools can be particularly effective in this regard.

An unintended, but highly desirable, side-effect of requiring regular progress reports is that students will become

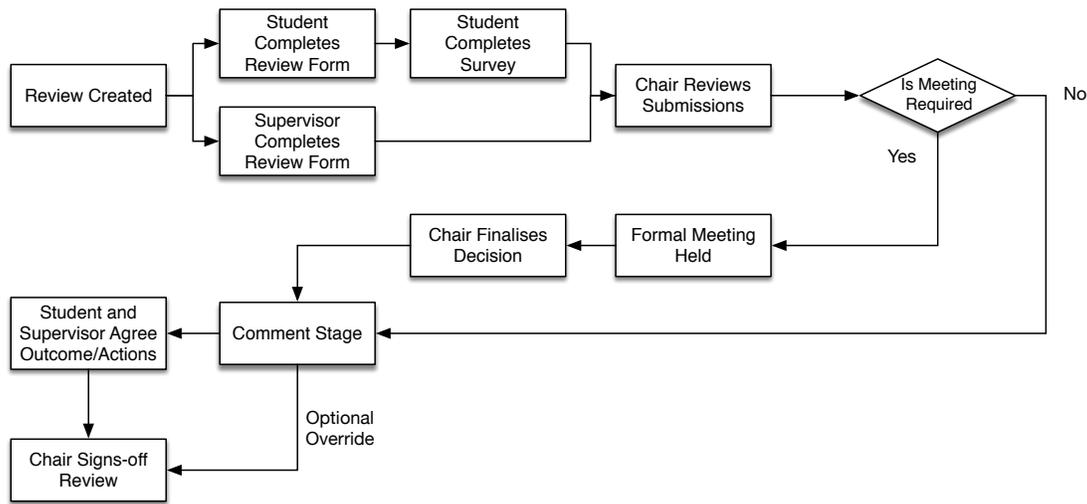


Fig. 1. Flowchart showing the proposed monitoring process. See Section 5 for full descriptions of each stage. The ‘meeting required’ decision is made in concert with the participants of the review rather than by any one party.

more reflective about their experiences. Previous investigations [33], [34] corroborate this assertion. As a consequence, students are more aware of their progress and accomplishments as well as where issues reside. As the student is already aware of potential failings, this can lessen the impact of some negative feedback. However, the accepted deviations regarding self-assessment must be taken into account [35]. The critical item from the cited list is that stronger students are harsher on themselves whereas weaker students, typically, overrate their work.

Within Bangor University, previous solutions have been unable to increase transparency. While the student concerned had input, the report from their supervisor was the final word. A meta-analysis [36] of 119 individual studies has found that the teacher-student relationship is one of the highest-impact elements that a teacher can control driving student achievement. To be transparent, a method that allows two-way constructive criticism is required. Such a system is necessary for ensuring continued viability of longer-term projects.

5 THE PROPOSED TOOL AND WORKFLOW

The Project Progress Monitoring System is designed to be a non-intrusive method bringing transparency and outside corroboration to projects at any level. Figure 1 shows, graphically, the proposed workflow; we explain each step in greater detail in this section.

The most obvious deviation from existing processes is that we recommend adding a *chairperson*. This participant is expected to be objective and ideally impartial. The chairperson acts as a moderator between the student and their supervisor. They hold the casting vote on whether the student has demonstrated sufficient progress or not. Any candidate for chairperson would be part of the same field of study, but not directly involved with the work. In smaller departments/schools/groups or those with a close-knit community, suitable candidates may be difficult to find. In these cases, we would expect the head of the community to make an executive decision in appointing a chair.

To make the process as straightforward as possible, we have implemented the system using familiar web-based concepts. The staff and students should already be familiar with these constructs as they are becoming more ubiquitous every day. Using these constructs means there is not another set of controls, concepts, and applications to learn. This familiarity should cause less anxiety, common with new systems, helping the process bed in rather than users pushing against it. However, there will always be segments of the student body that find using a web environment difficult. This effect may be particularly acute for mature students or those from lower socio-economic backgrounds who are not exposed to technology as much.

5.1 Process Description

5.1.1 Review Creation and Form Submission

Originally the authors envisaged a member of administrative or support staff performing the initial creation of the review for the appropriate students. However, there is no reason that each students’ primary supervisor could not carry out this task instead. The creation step simply involves selecting the program, phase of study, the form submission deadline and a provisional date for the review meeting (assuming it is required). There are no restrictions on when reviews may be scheduled. Most institutions’ regulations stipulate that a review must occur *at least* once a year. By accommodating more than one Review during any phase of study supervisors are given a level of flexibility to schedule reviews according to need, events, and ability.

Once created/scheduled, the student is asked to complete two forms each with a different purpose. The first form provides the student the opportunity to catalog their achievements, progress made, challenges faced, and goals for the next period (however long that may be). The student may (optionally) upload any supporting evidence they deem suitable. The second form named the ‘Confidential Survey’, offers a quantitative and qualitative view into the student experience. It is intended

to be a 'safe space' for the student to make observations and, if necessary, concerns about their situation. For the school/department/college/institution, these responses provide invaluable feedback when examined in an aggregate context for example, on a cohort, program or school level. In some regards, 'Confidential Survey' is a misnomer. It is only intended to be confidential from the primary supervisor so that the student has a mechanism to report critically on the working relationship. The survey is not meant to be confidential from the institution or chairperson. The authors would expect anyone appointed as a chairperson to abide by professional ethics in not revealing the contents of the survey unless there is anything of extreme concern.

The supervisor is asked to complete a different form, with prompts tailored to the evaluation of the student's performance. Evaluations use a four-point rubric; met/exceeded expectations, some improvement needed, major improvement required and unacceptable. These rubrics are intended to be generic; each school/department is then left to produce a form of words describing what each element means within the realm of their programs. Alongside each rating prompt, the supervisor must provide a rationale for the selection. Without this provision, the chairperson would be presented with a verdict but no evidence. We expect that students would use the upload feature to balance out any counter claims. Neither the student nor the supervisor is permitted to access the initial submissions of the other as the returns are intended to be independent.

5.1.2 Chairperson Review/Preliminary Decision

The chairperson receives a notification to review the initial returns when they are complete. The chairperson is asked to complete an identical form as the primary supervisor had. As the impartial observer, their ranking of performance is drawn from the evidence provided by both the supervisor and the student. The chairperson is also required to provide the rationale for their selections. It is anticipated that the chairperson will make reference to all three submissions in their rationales.

Assuming the best-case scenario, both the student and supervisor broadly agree on progress, and there are no significant concerns raised in the Confidential Survey; the chairperson can form a preliminary decision and suggests to the other participants that a formal meeting is not required. If accepted by all; the preliminary determination stands, the chairperson enters the student's plans as the Review Action Plan, and the process moves on to the approval/sign-off stage.

In the event of disagreement, doubts, mismatches, or concerns regarding the supervisory relationship chairpersons are actively encouraged to hold the Formal Review Meeting to explore these issues fully. There is no prescribed format for these meetings as this can vary with the type of problems identified. As with all aspects of assessment, the best practice is to form objective views of progress and performance. Ultimately, this would be resolved using the chairperson's professional judgment based on the submitted evidence and in-person representations from all concerned.

5.1.3 Action Plan/Comments

The output of any review is an Action Plan and formal decision on progression. The Action Plan, as its name suggests, is the formally agreed next steps. The suggested workflow provides for four categories of person that can have actions assigned: student, supervisor, school and other. These four have been selected in recognition of the fact that despite participants' best efforts, other external factors may result in a poor outcome in a review or of the project. Examples of actions on a school could revolve around improved access to resources, library materials or clarification on process, regulations or assessment criteria. The 'other' actor is included for situations where there may be institution-wide changes or clarification required, where projects include an industrial, professional or clinical partner or any other third-party needing to complete actions to ensure the ongoing success of the project.

Rarely, in assessment matters, are things completely black and white. Research and other longer-running project work present a particular challenge as multiple skills are judged at once. To balance the power assessors wield in these situations, any of the participants have the ability to make comments on the process. The system stores these remarks alongside the submissions and decisions; allowing objections and corrections to be noted. The authors envisage situations where the participants disagree on the scope, wording, or presence of items on the action plan. It remains within the chairperson's option to adjust the Action Plan or formal decision based on this new information.

5.1.4 Agreement and Sign-Off

As with almost any formal procedure, the review process ends with an agreement stage. Usually with paper-based systems, and more than a few electronic ones, this agreement takes the form of a signature. With a web-based solution, physical signatures are not a viable option. A standard digital solution is to replace the physical signature with some form of encryption that provides a 'digital signature'. However, these technologies require more knowledge and cyber-security skills than an average lay-person possesses.

An alternative approach is to use a tried and tested mechanism that all modern computer users are familiar with, their username and password. By making the agreement a 'secured' positive action, the participant is forced to log into the system to perform the agreement action to signify their assent. Any users' credentials are supposed to remain secret meaning that we can reasonably assume the person making the confirmation is whom they say they are. (There are wider implications for a student and the institution if any users' credentials are misappropriated.) Asking an identified/authenticated user to perform an action that not automatically completed has been held to provide a suitable analog to a signature [37]. While approval is still pending; all participants are still permitted to comment. The chair is authorized to alter the Action Plan in response. If they choose to do so, all previous approvals are reset. This protection is to prevent a situation where someone who had previously agreed no longer agrees, due to the changes.

Assuming that all participants agree to the decision and action plan as is, they would signify their approval

and the system notifies the chairperson that the review is ready for sign-off. Once a review has been signed-off, no further changes or comments are permitted. However, if one participant is proving to be particularly intransigent, the chairperson is authorized to force the issue, overriding the objections. This ability is required to diffuse a situation where a student refuses to give approval, most likely as it would result in a poor outcome, to prolong the process. If this occurs, a comment is added to the review attesting to the override, the review is signed-off, and all participants notified.

6 TOOL DESIGN

Most, if not all, interfaces with other systems and technologies have been configured to use Bangor University's IT infrastructure. However, in most cases it would be trivial to adjust for another institution assuming standards compliance.

The largest consideration in the design of a project monitoring system is the management of the sheer quantity of differences among the various projects and levels. The simplest solution to this issue is to make the entire system data driven, rather than to hard-code any assumed choices. As with all large development projects, the primary task is to scope, define, and investigate the problem domain. In this case, the main entities in the system are; Student, Supervisor, Chair, and Review. Chair, student, and supervisor are all forms of a user and only vary the role held within any given Review.

There are only two concretely defined entities within the system; Programs and Progress Rubrics. Programs represent types of activities to be monitored, in this case, degree types. The full list of available Programs are:

- B.Sc.
- B.A.
- M.Phil.
- M.Sc.(Res)
- M.Phil. [Part Time]
- M.Sc.(Res) [Part Time]
- Ph.D.
- Ph.D. [Part Time]
- Research (Generic or non-student)

There are four Progress Rubrics:

- Achieved/Exceeded Expectations
- Targeted Improvement Required
- Significant Improvement Required
- Unacceptable

Individual schools/departments are able to customize the exact wording of each prompt.

Initially, the tool was implemented using features offered by Bangor's chosen VLE, Blackboard™. However, the task was ultimately beyond the capabilities of this tool. Within Blackboard, assignments and quizzes (types of student submissions) only have two participants, instructor(s) and the student/learner.

6.1 Form Versions

Every Review will contain the three forms, but these must vary by School and over time. The concept of Form Versions are used to accommodate this variance; a simplified Entity Relationship Diagram illustrates this in Figure 2.

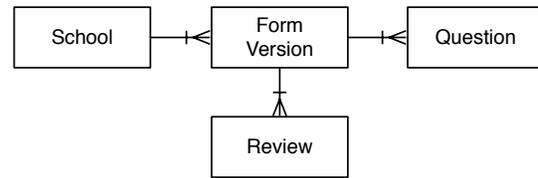


Fig. 2. Entity Relationship Diagram showing Form Version relations.

Using the versions concept; the system can recreate the form as was in use at the time - irrespective of how much time has passed or how many subsequent versions there are. Administrators may mark versions as 'available for copy', allowing others to base their form on this shared or reference copy. The shared versions are then made available to all departments/schools to base their on form versions on. Similarly, each version can be marked as 'active'. A version can only be used in a Review after being made active. The tool's algorithm selects the most recent active (highest version number) for the selected school when creating Reviews.

6.2 Question Types

To allow users to define their questions; the tool provides some basic question types. The type frames the mode of response the participant can make. Each type has an associated user interface (UI) files and handling routines built into the tool. These routines handle the associated data operations, controlling the display and storage of submitted responses. The initial set of question types provided in the first release of the tool are:

- 5-Point Likert Scale
- File Upload
- Free-form Text
- Progress Rubric
- Yes/No

Due to the logic associated with each question type, the tool will need to undergo further development to accommodate changes to the types. This set was based on types used in Bangor University's previous paper system. Section 7 presents the case studies made using the tool. The second case study (with undergraduates) did not require any changes to the question types.

6.3 Authentication and Role Identification

A crucial part of any IT system is security, identifying and authenticating users within a system, and granting appropriate access. The tool could be configured to use its database with user credentials. However, university staff and students already have many other credentials for separate systems in addition to their institutional ones. The tool has been configured to use the Lightweight Directory Access Protocol (LDAP). This protocol integrates the tool with the

institution's Active Directory database so that users may authenticate with their usual institution credentials.

The tool offers auto-complete when entering student, staff or chair details. This is achieved using the same LDAP connection and the organizational groups configured within the Active Directory. All staff members belong to various defined groups, such as the exported group of staff members from the campus management software "Banner". Similar groups exist to identify students based on their course, cohort, supervisor and degree program. This detail allows the tool to restrict searches for a student's name, surname, or username to those that are needed, based on the course/program under review.

6.4 Form Visibility

In the original design, all participants were able to see the details about the review, the deadlines, status and stage, action plan, comments etc. They were also able to review the forms that they had completed. This restriction means the student was not able to see their supervisor's return. The chair meanwhile could view anything. Some study participants felt that while they were able to see the final decision, they should be entitled to see the final report submitted by the chair to the institution. The second version of the tool included this suggestion, but only once the review was finalized. We did not make the remaining forms any more open, keeping the independent nature of the submissions to avoid bias or tainted results.

6.5 Security and Limited Access

As this tool is a prototype and has a deliberately limited user group, the decision was taken only to make it available to the Bangor University campus. As such, no party (including students with a review pending) could access it from a general internet connection. The primary motivation was security. Every endeavor was made to ensure the tool did not expose confidential information. However, a full security review was not conducted on the software. There may be, however unlikely, situations where the application could leak data or allow unauthenticated users access to sensitive systems. During the studies, the authors were aware that this decision may make it more inconvenient for participants to complete the process. As such, the evaluation survey was changed to try to assess this impact quantitatively.

7 CASE STUDIES

Two studies were carried out; the first using a postgraduate setup, the second using forms modified to be useful to undergraduate students. Both studies were carried out using staff and students in the School of Computer Science at Bangor University between 2015 and 2016. The number of participants in these studies is too small to draw generalized conclusions. However, they do show positive results.

7.1 Form Configuration

In both studies, the configuration of the forms was set to match an updated internal paper review process. This

update more closely aligned the system with the Postgraduate Research Experience Survey (PRES) developed by the Higher Education Academy². The student review form contains the usual four questions prompting for details of their achievements, progress, challenges, and plans. The Confidential Survey asks the following, using a five-point Likert scale:

- 'I know whom to speak to/contact if I have a problem or concern about my studies.'
- 'Staff make an effort to understand any difficulties I face.'
- 'I understand the standard of work that is expected of me.'
- 'I have adequate access to the necessary research equipment.'
- 'I have adequate access to the library facilities necessary for my research.'
- 'I have suitable working space at the School.'
- 'Feedback from my supervisor(s) helps me plan my research/work.'
- 'I have the technical support I need.'
- 'I am encouraged to think about my career development needs.'
- 'I feel integrated into the research community of the School.'
- 'There are opportunities for social contact with other research students in the College and University.'
- 'I understand the requirements of the monitoring process.'

Lastly, the student is offered an opportunity to raise any other concerns they wish to. The prompt reminds students that to generate a positive outcome, they must detail the issue exactly along with a desired course of action. There is no method to measure these matters or their severity quantitatively. The chairperson must decide if and how much weight each is afforded within the process.

The supervisor and chairperson are asked to rate the students on the following aspects of their development and capabilities displayed during the review period.

- Project Management Skills
- Knowledge and Understanding
- Theoretical/Numerical Analysis Skills
- Experimental Skills
- Written Presentation Skills
- Oral Presentation Skills
- Overall Progress

There are four rubrics available for each rating. From best-to-worst; "Met or exceeded all specified requirements.", "Substantively met requirements, targeted improvement needed in some areas.", "Failed to meet requirements in some areas. Significant improvement is required." and "Failed to meet requirements for the course."

For each rubric prompt, there is a corresponding free-form prompt for the rationale. The staff form also includes a five-point Likert scale question to comment on the effectiveness of the supervisory relationship.

2. Full details of the survey, methodology and results can be found at <https://www.heacademy.ac.uk/research/surveys/postgraduate-research-experience-survey-pres>

7.2 Study Sample 1: Ph.D. Progression

Our first study implemented the prototype tool for the review of Computer Science Ph.D. students at the end of A.Y. 2014/15. This study involved ten full-time students, four home (UK) and six international, at varying stages of the three-year program. The school formally reviews these students' progress at the end of each year, with individual supervisors monitoring day-to-day efforts. As such, each student only completed the review process once. The output from the tool was used directly to generate the return submitted to the doctoral school, complete with decisions.

Two of the eight reviews flagged sufficient differences to require the formal meeting of the chair, supervisor, and student. In the remaining six cases, the chair determined that the students have made sufficient progress. All but one student progressed to the next phase of their studies; the other student agreed a repeat of their study period due to a change of topic and supervisor for reasons beyond the student's control. They were all asked a battery of questions, after their experience to evaluate the process; only 8 of the students provided complete responses. See Appendix A for the full data set.

All students understood the process that they were being asked to undertake, and most (5/8) utilized the new features offered to them. All but two (6/8) liked the modified review process. All eight students reported they liked using a web-based system, and that they would not have rather used a paper-based one. This result goes some way to proving the utility of the system and that it is an improvement over previous attempts. As discussed in the design section, students would be unable to access the prototype from external internet connections. Three students highlighted that being unable to use the system from their home was a limiting factor. Open access to a final, thoroughly tested and secured system is not expected to be an issue.

The students approached the task in a matter-of-fact style, simply reporting successes and challenges with little comment or explanation. The plans they presented were similarly objective. This response may represent the standard supervisory dynamic. If the student felt they had an issue requiring intervention, it would have been brought up with their supervisor at the time.

The largest benefit to the School of Computer Science is in the students' responses to the Confidential Survey. These highlighted to School Management four 'quick wins' to improve the student experience. These were related to journal access, perceived IT issues, and social integration. The School was able to make more information and changes within the department to directly address the reported concerns almost immediately. However, the issue of social integration with a student body that has undergone a drastic shift in ethnic balance over recent years will require longer term consideration and action. The previous system/process did not include any way to capture any of this information. Any comments would have been made directly to supervisors and may not have been communicated effectively to higher levels of management.

7.3 Study Sample 2: Undergraduate Dissertations

A sample of three undergraduates participated in the trial of applying the process to another level of study. The students selected were a convenience sample, however, the group were all following different degree programs providing necessary variation. These students were reviewed slightly less formally, because in the review outcome did not decide if they were able to continue in their project/program. Instead of this being at the end of a year or project, the students were reviewed every three weeks. This time-frame was chosen to provide a continuous tracking of progress data without adding too much undue burden on the students. Each student completed a total of three reviews.

In all nine cases, the supervisor and chairperson both agreed to forgo the formal meeting with the student. None of the reviews highlighted any significant differences of opinion on progress or achievement. When reviewing the returns for the entire study, both the supervisor and student have identified the same areas of success and improvement. The students show an unexpected level of self-awareness and critical analysis. Two (of the three) were able to identify causes for slow progress accurately. However, the last student was either less aware of the causes, or less inclined to details them on the form.

The undergraduate participants were asked to complete a similar survey on their experiences - all three did so. The survey questions were altered to avoid confusion; routine monitoring is not usually a part of their final year project in this form. Appendix B lays out the responses to this survey including the changed question texts.

Most likely a result of the unfamiliar process of continuous monitoring, there was a reluctance to use previous review returns to inform the next. The three show an effective indifference to the usage of reviews in encouraging progress or the reporting of progress being informative. There was a 2:1 split among the students against the process, not liking it overall and not finding using the Confidential Survey worthwhile.

However, the response was reversed (now being favorable) when asked about the tool, its web-based context and ease of use. This observation supports the assertion that current students are more at ease with web-based systems. The number of contributions, achievements, and challenges noted by each student in each review are small. This effect is explained by the shortened review period in this experiment. Responses detailing the amount of time the form required shows a similar effect.

In this sample, there was no stand-out benefit to the School. However, as there were no causes for concern voiced in either type of student forms; we can conclude the process is fit for purpose at the undergraduate level. The study had a dual-mission. As well as testing the tool/process; it was also designed as a verification of supervisory skills as the academic concerned was mentoring dissertation students for the first time. The result that no student felt that there were issues with the supervisory relationship and that the chair felt that both sets of submissions were in keeping with each other indicates that the supervision was effective.

7.4 Discussion

There is, in both samples, a widespread acceptance of the process with only one participant (of the 11 completing the survey) indifferent to the change. No student expressed the view that they would prefer to use a paper-based system, despite just over half (6 of 11) not using the extra features that a web-based system offers them, namely uploading and attaching evidence.

Both surveys share an interesting finding; the authors assumed that students would utilize previous data to inform their current responses. Only two students reported doing this. This observation may be a side-effect of the change to the on-line system. Ready access, through the system, to the previous data may well change student practice in the future.

As can be expected, there is a distinct difference between responses of the utility of the review process itself between postgraduate and undergraduate students. Postgraduate students accept and understand the necessity of regular monitoring as part of their studies. By contrast, undergraduates appear to view the process as a nuisance as it is not core to the completion of their dissertation projects. If the process were to be extended to the entire cohort, we expect this perception to improve as there will be less difference between individual student experiences. Completing reviews would become a standard feature rather than the exception.

So far, the student experience has been the focus as they are the primary user. However, the utility and experience of supervisors and chairs must not be discounted. The collection method for their experiences was informal, asking for honest opinions and how the replacement has affected their practice with the students.

“I found the new system to be a joy to use compared to the existing paper-based approach. Having everything managed automatically also meant that more time could be spent concentrating on providing better feedback to students rather than spending more time on administration.” (Dr. William J. Teahan, Director of Postgraduate Studies, School of Computer Science - Supervisor and Chair)

“The progress of every research student is formally reviewed on an annual basis up until the successful submission of the thesis. The system was developed for tracking individual students’ academic progress, so that school and mentors are aware when a student is struggling academically at early stages of their studies. The system was easy to use by both the supervisor and the student. In addition a user manual is provided describing the various form options. The form summarizes the student’s research progress and highlights at early stages any supervisory issues.” (Dr. Sa’ad P. Mansoor, Head of School, School of Computer Science - Supervisor and Chair)

This system does not only measure the student’s performance over time but it can also be used to measure the effectiveness of Continuous Professional Development (CPD) for supervising staff members over time too. The addition of the chairperson, and their objectivity means that they are ideally placed to make a judgment on how well their other participants’ view correlate with each other. This may also be used as part of the training provided to new supervisors when handling their first project/research student.

After further review, Bangor University has decided to roll-out the system to all postgraduate programs without modification. Individual schools will still be able to customize forms as they see fit, but the basic process/work-flow will remain intact. The authors take this as final confirmation that the system is sound. Students will begin utilizing the institution-wide version from A.Y. 2016/17.

8 CONCLUSION

We have presented a viable process and tool for handling on-going monitoring of academic projects. The prototype has been successfully deployed in two case studies, looking at both undergraduate and postgraduate work. The use of a familiar, web-based environment has proven to be popular with the students involved in our case studies. Supervisors and administrators have similarly approved, citing a reduction in the manual processing leaving more time to focus on their students.

The Form Versions concept allows the tool to keep pace with institutional needs over time without re-development. The tool earmarks each review with the version of the form used, enabling administrators to recover historical entries/reviews with ease. Similarly, the versions allow department or project group level variance. This flexibility alleviates the burden, common to such institution-wide efforts, of finding a one-size-fits-all form. Also, the flexibility permits the process to be applied to other periodic monitoring tasks, assuming there are the same three parties and the same types of forms in use.

We set out to amend a under-performing process mired in paperwork, with an efficient one supported by a web-based tool. We have shown, in two instances, our proposed solution has increased student satisfaction, reduced administrative burden, all the while increasing utility and transparency. The system is being made available to all Schools at Bangor University. Service departments are also inquiring about adapting the tool to their internal review processes. We have therefore concluded that the project has been a success and delivered upon its stated aims.

ACKNOWLEDGMENTS

The authors would like to thank the undergraduate and postgraduate students at Bangor University for participating in the trial of this tool, and for providing invaluable feedback on the process. Also, the authors thank the contacts at other institutions for providing invaluable access to their processes and regulations.

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**APPENDIX A
POSTGRADUATE STUDENT SURVEY DATA**

The responses have been split by question type, there are eight (8) respondents in total. Tables 1 to 3 show categorical responses. Table 4 contains the Yes/No responses. Table 9 (page 11) contains all Likert-scale questions.

TABLE 1
Postgraduate Time Spent Responses

Question	Little (<30 min)	Some (>30min, <2hrs)	Lots (>2hrs)
1: How much time did you spend completing each review submission?	3 (37.5%)	4 (50%)	1 (12.5%)

TABLE 2
Postgraduate Achievement Responses

Question	None	1-2	3-4	5 or more
6: How many achievements did you list on the review?	0	3 (37.5%)	1 (12.5%)	4 (50%)

TABLE 3
Postgraduate Challenges Faced Responses

Question	None	1	2	3 or more
10: How many challenges did you identify on the review?	1 (12.5%)	2 (25%)	2 (25%)	3 (37.5%)

TABLE 4
Postgraduate Yes/No Responses

Question	Yes	No
14: Were there any questions that you were unable to answer?	0	8 (100%)
15: Were there any questions that you felt were inappropriate to ask?	1 (12.5%)	7 (87.5%)
17: Did the website break or show any errors while filling out your reviews?	0	8 (100%)
21: I uploaded evidence to the website to support the points in my review.	5 (62.5%)	3 (37.5%)
24: Would you have rather used a document-based or paper system instead of the website?	0	8 (100%)

**APPENDIX B
UNDERGRADUATE STUDENT SURVEY DATA**

The results have been split by question type, in the same way as Appendix A. Tables 5 to 7 show categorical responses. Table 8 contains the Yes/No responses. Table 10 (page 11) contains all Likert-scale questions. There are three (3) respondents in total.

TABLE 5
Undergraduate Time Spent Responses

Question	Little (<30 min)	Some (>30min, <2hrs)	Lots (>2hrs)
1: How much time did you spend completing each review submission?	3 (100%)	0	0

TABLE 6
Undergraduate Achievement Responses

Question	None	1-2	3-4	5 or more
6: How many achievements did you list on the review?	0	2 (66.6%)	1 (33.3%)	0

TABLE 7
Undergraduate Challenges Faced Responses

Question	None	1	2	3 or more
10: How many challenges did you identify on the review?	0	3 (100%)	0	0

TABLE 8
Undergraduate Yes/No Responses

Question	Yes	No
14: Were there any questions that you were unable to answer?	0	3 (100%)
15: Were there any questions that you felt were inappropriate to ask?	0	3 (100%)
17: Did the website break or show any errors while filling out your reviews?	3 (100%)	0
21: I uploaded evidence to the website to support the points in my review.	0	3 (100%)
24: Would you have rather used a document-based or paper system instead of the website?	0	3 (100%)

TABLE 9
Postgraduate Likert-Scale Responses

Question	Strongly Disagree (1)	Mildly Disagree (2)	Neither Agree Nor Disagree (3)	Mildly Agree (4)	Strongly Agree (5)
2: The reviews helped me gauge my progress.	0	2 (25%)	1 (12.5%)	5 (62.5%)	0
3: Reporting my progress every year helped me keep track of my overall progress.	0	0	6 (75%)	2 (25%)	0
4: I was motivated to make progress each time because I knew I was being asked to fill in a review.	0	2 (25%)	3 (37.5%)	3 (37.5%)	0
5: I think I made progress over this review period.	0	0	3 (37.5%)	5 (62.5%)	0
7: I found writing a list of what I had achieved during each period useful.	0	0	4 (50%)	3 (37.5%)	1 (12.5%)
8: I liked the review process, for whatever reasons.	0	2 (25%)	3 (37.5%)	2 (25%)	1 (12.5%)
9: I found having a confidential survey to discuss the relationship with my supervisor to be useful.	0	2 (25%)	3 (37.5%)	2 (25%)	1 (12.5%)
11: I found the questions asked difficult to answer.	1 (12.5%)	3 (37.5%)	2 (25%)	2 (25%)	0
12: I didn't like answering the questions asked of me.	1 (12.5%)	2 (25%)	4 (50%)	1 (12.5%)	0
13: I used the information from previous reviews to complete this one.	2 (25%)	2 (25%)	1 (12.5%)	2 (25%)	0
19: I found not being able to use the website from home limiting.	0	3 (37.5%)	0	1 (12.5%)	4 (50%)
20: I found the website easy to use.	0	0	2 (25%)	3 (37.5%)	3 (37.5%)
21: I liked the range of options/answers that I was allowed to give.	0	0	3 (37.5%)	3 (37.5%)	2 (25%)
22: I liked using a web-based system for the monitoring process.	0	0	0	5 (62.5%)	3 (37.5%)
23: Using a website made answering the review and confidential survey questions easy.	0	0	0	5 (62.5%)	3 (37.5%)

TABLE 10
Undergraduate Likert-Scale Responses

Question	Strongly Disagree (1)	Mildly Disagree (2)	Neither Agree Nor Disagree (3)	Mildly Agree (4)	Strongly Agree (5)
2: The reviews helped me gauge my progress.	0	1 (33.3%)	1 (33.3%)	1 (33.3%)	0
3: Reporting my progress every 3 weeks helped me keep track of my overall progress.	0	1 (33.3%)	1 (33.3%)	1 (33.3%)	0
4: I was motivated to make progress each time because I knew I was being asked to fill in a review.	1 (33.3%)	1 (33.3%)	0	0	1 (33.3%)
5: I think I made progress between each review.	0	0	1 (33.3%)	2 (66.6%)	0
7: I found writing a list of what I had achieved during each period useful.	0	1 (33.3%)	2 (66.6%)	0	0
8: I liked the review process, for whatever reasons.	0	2 (66.6%)	0	1 (33.3%)	0
9: I found having a confidential survey to discuss the relationship with my supervisor to be useful.	0	2 (66.6%)	0	1 (33.3%)	0
11: I found the questions asked difficult to answer.	0	1 (33.3%)	1 (33.3%)	1 (33.3%)	0
12: I didn't like answering the questions asked of me.	0	3 (100%)	0	0	0
13: I used the information from previous reviews to complete this one.	1 (33.3%)	1 (33.3%)	1 (33.3%)	0	0
19: I found not being able to use the website from home limiting.	0	1 (33.3%)	2 (66.6%)	0	0
20: I found the website easy to use.	0	0	1 (33.3%)	2 (66.6%)	0
21: I liked the range of options/answers that I was allowed to give.	0	0	2 (66.6%)	1 (33.3%)	0
22: I liked using a web-based system for the monitoring process.	0	0	1 (33.3%)	0	2 (66.6%)
23: Using a website made answering the review and confidential survey questions easy.	0	0	1 (33.3%)	0	2 (66.6%)