JAMTART: An online performance support system for project management

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This article was originally published as: McMahon, M. & Luca, J. (2007). JAMTART: an online performance support system for project management. In M. Docherty (Ed.), 'Contribute, Communicate, Collaborate' Proceedings of the Apple University Consortium Conference 2007 (pp. 12-1 - 12-8). Gold Coast, Queensland: AUC.

This Conference Proceeding is posted at Research Online.

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Contribute, Communicate, Collaborate

AUC
Apple University Consortium Conference 2007

Royal Pines, Gold Coast
23-26 September 2007
Apple University Consortium Conference

"Contribute, Communicate, Collaborate"

Proceedings of the
Apple University Consortium Conference
23-26 September 2007

Crowne Plaza Royal Pines Resort
Gold Coast, Queensland
Australia

Editor
Michael Docherty
Queensland University of Technology

ISBN: 978-0-947209-36-0
http://www.auc.edu.au

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Editor’s Note

The papers offered in this year’s proceedings of the Apple University Consortiums Conference represent a diverse and innovative approach to the theme; Contribute, Communicate, Collaborate.

A range of full papers were presented for review, and the acceptance rate was just under 50%. The selection procedure involved a rigorous review by a panel of academics in which each paper was refereed by at least two reviewers and assessed by each against normal academic publishing standards, and recommended solely on the academic merit of content.

In addition to the full papers, a number of presenters were invited to contribute and abstracts are included in these proceedings.

My thanks goes to the panel of referees for their help in the onerous but rewarding task of selection of these papers, and to Stephen Atherton and Andrew Jeffrey for organising the Call for Papers and collation process and the arrangement of publication in printed and electronic form.

Michael Docherty
Proceedings Editor

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Abstract. The continuing focus on generic skills in higher education and the embedding of graduate attributes into university policy and planning requires a rethink of how such generic skills can be promoted in a holistic and contextual manner. JAMTART is a product that has been developed to address key generic skills processes inherent in the project management of team-based interactive media development. The three main modules of Self-assessment, Team monitoring, and Reporting and reflection are tied closely to the planning, monitoring and evaluation inherent in metacognitive processing. This paper describes the product in the light of this underpinning theory.

Keywords. Metacognition, E-Learning, Teamwork, Performance Support

1. Introduction

Over the last decade, there has been a growing emphasis in higher education institutions on students developing skills that go beyond the curriculum. These include teamwork skills, problem solving skills, decision-making skills, communication skills and information literacy. Research has shown that while many students do come to university with existing skills in teamwork, information literacy, critical thinking and so on, this is not true for the majority of students (Leamnson, 1999). As a result, ‘Generic skills and graduate attributes have emerged as vital issues for both educational institutions and the communities that they serve, including students, employers and governments.’ (Goldsworthy, 2003, p. 1). However a recent study has found that the effective implementation of these can be described as patchy at best (Barrie, 2006).

Fundamental to the concept of generic skills is that these transfer across domains. It is logical to assume for example that if a person has the generic skill of information literacy they could apply that to a variety of settings. This ability to transfer across domains can be seen as a fundamentally metacognitive skill. This becomes problematic metacognition can be interpreted as an inherently internal psychological state. This suggests, therefore, a need to develop mechanisms that focus on external indicators such as the overt use of monitoring and strategy development, as that is how it is manifest (Schraw, 1995). This position is further reinforced by Jacobson (1998) who defines metacognition both as ‘knowing the process by which one learns’ (p. 3) and, in citing Borokowski, Carr, and Pressley (1987) as ‘the self-monitoring of, and conscious use of learning strategies’ (p. 4).

This tension between metacognition as an internal state and the need to find means of external evidence to support it is further complicated by the ‘genericness’ of generic skills themselves. One of the primary aims of the JAMTART project was to provide a mechanism to externalise the internal processing inherent in metacognitive activity while providing an environment that is grounded in authentic goal driven activity rather than an abstract ‘generic’ and academic tasks.

The outcome was to explore ways of enhancing learners generic skills within a particular context, in this case that of project management and teamwork. The goal was to create an environment that exposed metacognitive processing in an explicit and tangible way, while at the same time being an inherently useful product for students in developing applied skills.

2. A Plan for the Development of Implicit Skills through Explicit Activity

Three main tenets were developed for the JAMTART project. These were:
• Metacognition as key enabler in the development of generic skills and their importance to contemporary education;
• Extension of traditional linear approaches of “Plan, Do, Review” to help promote iterative and internally reflective ways of engaging students in regulating their own learning, to help progress the value of metacognitive theory; and
• Enabling students to make better decisions about what to study and what roles to take in teams with a view of developing a stronger self-awareness about their skills.

The first has been discussed, while the second was articulated through a review of the literature to identify the explicit primary processes that underpin all metacognitive activity. Nelson and Narens (1994) developed a simple but influential model of metacognition that defined it in terms of a reciprocal flow of information between object and meta-level thinking that involved a monitoring activity and then controlling it as a result of monitoring. Fogarty (1994) expanded on this concept to define metacognitive monitoring in terms of planning, monitoring and evaluation. This formed the theoretical basis of metacognition as it was implemented in JAMTART.

The final tenet requires the grounding of activity within a context that is useful. Development of new media products provided a powerful mechanism for this. Graduates of ECU’s Bachelor of Creative Industries in Interactive Media Development are typically required to follow an industry model that is based upon small teams developing products for clients.

Teamwork is a common generic skill and one that was considered by the researchers to be integral to the development of a successful career in this area. Ineffective teamwork has proven to be a major cause of problems for both commercial development and university projects. The goal, therefore was to develop a tool that could incorporate planning, monitoring, and evaluation of learning processes throughout students’ experiences in the development of interactive media products. One common way of exposing such processes in the domain of teamwork is through self and peer assessment. Such assessment involves students making judgements about their own learning and that of others, which contribute to the development of autonomous, responsible and reflective individuals (Sambell, McDowell, & Brown, 1998; Schon, 1987).

JAMTART was developed as the means to achieve this by acting as an Electronic Performance Support System that could track student’s progress through the life of a development project, and engage learners in the above processes.

3. About JAMTART

JAMTART was designed around the three basic metacognitive processes of planning, monitoring and evaluation in the manner outlined in Figure 1.

![Figure 1](image_url)
The approach is broken down into a number of phases that users would go through that were tied directly to the product development lifecycle, while identifying key stages of metacognitive processing that occurred at each phase of the lifecycle. Ultimately, JAMTART was conceptualised as a suite of discrete modules integrated into a whole. Specifically, the product consisted of:

- a self-assessment tool;
- a team monitoring tool; and
- a reporting and reflection tool.

The initial phase of team development and the setting of team goals, milestones, individual responsibilities and so on are inherently planning processes. One could legitimately argue that planning is like predicting the future – anyone can do it, but the hard part is getting it right. For that reason, the process of planning is not treated as a one that takes place within a vacuum. The first role of the product is to provide a means for users to make plans. To that end, JAMTART was built in a modular fashion with the first module dedicated to the process of self-assessment. This provided a basis for the formulation of plans.

The second module was designed to allow users to monitor their performance as they progress throughout the iterations of development in their projects. It provides a breakdown of jobs and activities within specific periods and allows users to track their performance as well as the performance of others.

The final report builder has a role in providing visual and table based summaries of the activity within the product throughout the whole development. This reporting tool acts as a way of prompting reflection on the part of the user. From a project management perspective it acts as a means of conducting a post-mortem about the project. From a metacognition perspective its role is engaging the learner in the process of self-evaluation to round off the planning, monitoring and evaluation process. Each of these modules is described and illustrated in the following sections.

3.1 Self-assessment tool

The self-assessment tool consists of a generic rules-based system that allows administrators to set up likert scale tests, judge the responses and provide feedback on user performance. A student view of the self-assessment tool is shown in Figure 2.

![Figure 2. Self-assessment tool - users view](image)
Beneath quite simple looking system is a fairly complex set of rules that need to be developed to provide feedback for users.

The Four main components required in setting up an assessment are:

- dimensions;
- statements;
- rules; and
- feedback.

Dimensions are set up as categories to group survey statements. Each statement created is attached to a specific dimension that indicates the concept which the statement addresses. In the case of this implementation of JAMTART, the dimensions related to the skills inherent in team-based projects. Therefore, each statement addressed one of the dimensions of accepting criticism, communication, creativity, leadership, problem solving, and teamwork. Therefore dimensions can be used to address generic skills themselves. The administrator’s view of the statements component is shown in Figure 3.

![Figure 3. Statements in the self-assessment tool - administrator view](image)

Once each statement has been developed and attached to a dimension, rules need to be designed that judge the results that are created when an end user fills out the online questionnaire.

Rules are developed based upon simple Boolean logic. How they respond to certain dimensions in comparison to others dictates the nature of the feedback that users receive. The process involves comparing dimensions based on operators such as greater than, equal to, more or less than a certain percent positive response and so on. These rules can be nested and therefore become quite complex. This is shown in Figure 3, which demonstrates ten rules applied to judge the extent to which a user’s response demonstrates a predisposition towards the role of being a graphic designer. In this example feedback was created and attached to the rule, which would then be displayed for the end user if the rule criteria were met.
Figure 4. Rules and feedback - administrator view

While the self-assessment tool can be used to create feedback on users’ performance on any type of likert scale questionnaire created within the tool, in this case, the rules, statements, feedback and dimensions were created to assist learners in defining a role within a team. Students generated their roles within JAMTART and these then carried through to the team monitoring tool.

3.2 Team monitoring tool

In a sense, the Team monitoring tool can be seen as the heart of JAMTART as it is the tool with which learners would spend the most time, being required to work with it at regular intervals during the project management lifecycle.

The tool has much in common with existing project management tools, but has the important distinction that it maintains an audit trail of users’ performance throughout the project, and acts as a tool to capture their reflections on that. In this sense, it includes planning and evaluation, but through a process of continuous monitoring and reconfiguration of plans based upon formative evaluation.

The main components of the Team monitoring tool are the Job Tracker and its subordinate Job Cards. As team members select roles jobs, and identify timeframes for their completion they appear to the team in the form of a project summary.
For each job and for each period, discrete Job Cards are filled in by users and then revisited at the end of that period for reflection. Users are required to identify what went wrong or right and what changes need to be made to the schedule of next period. These changes to individual Job Cards are then automatically updated in the Job Tracker.

3.3 Reporting and reflection tool

The Team monitoring tool results in the collection of a significant amount of data about individual and team activity throughout the project. Attached to these are the ongoing reflections made by the users as they review their performance and reconfigure their plans through the job card system.

Ultimately to work effectively as a tool for final self-evaluation, these forms of data need to be summarised in a manner that assists learners in reflecting on their performance. This was achieved within JAMTART through the reporting and reflection tool.

This component enables the following reports to be generated from a team’s dataset within JAMTART:

- Actual hours
- Individual job history
- Individual vs. group contribution
- Job-by-job project summary
- Project reflections

An administrator can attach prompts for comments from end users on each report. The first four of these are focused closely on the actual data generated from the Team monitoring tool. The final report, however, can be created by administrators to address more holistic issues through specific questions asked of end users that enable them to articulate their experiences in their own words as a project post-mortem.
An example of a job-by-job project summary is shown in Figure 6. This demonstrates a visual summary of each job through a graphical chart depicting actual vs. estimated hours. Other forms of summary include tables of job cards with their attached comments, overviews of the performance of each member of the team and so on.

![Figure 6. Job-by-job project summary - administrator view](image)

As well as a prompting and reflection tool, this part of JAMTART was also designed to provide a basis for assessment. Each user’s set of reports can be viewed as an e-portofolio and then used as a means of promoting discussion to deal with issues such as workload inequity.

### 4. Development, Piloting and Implementation of JAMTART

JAMTART was developed in PHP/MySQL and hosted on an OS X Apache web server. This infrastructure provided a reliable means of staging the product as well as an ability to integrate effectively with the school’s learning management system. The open source nature of PHP/MySQL also enhances its portability and ease of modification.

A pilot implementation was conducted in semester 1 2007, from which these examples have been drawn. The next stage of development is to create a generic portal to the product that enables it to be used in a standalone manner, with the administrator being able to generate groups and periods to which end users can assign themselves and select roles. Ultimately JAMTART will be able to be implemented on any PHP server. As design-based research, this stage represents the first in an iterative process of design, implementation and refinement (Cobb, Confrey, DiSessa, Lehrer, & Schauble, 2003). Research generated from this pilot will be presented to delegates with feedback used to inform the next version of the product.

While metacognitive regulation of learning is a difficult concept to both define and delineate, there is evidence that engaging learners in planning, monitoring and evaluating their thinking processes can contribute to the development of generic skills that can then be applied across a range of learning and professional domains. JAMTART represents an attempt to engage learners in this type of activity while maintaining a strong focus on nurturing industry relevant skills rather than abstract academic forms of thinking.
References