

Agile in Government: Successful on-time delivery of Software

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Abstract

The use of agile processes in state government ICT branches is largely unheard of or just confined to development teams utilizing Extreme Programming (XP). Software projects at Queensland Dept of Housing once followed the traditional Waterfall model where after a large upfront investment of business requirement gathering, coding and testing, software was delivered to the business. However this model did not suit rapidly changing business requirements from new policy directions. Business areas demanded systems delivered within timeframes mandated by state and federal policy initiatives.

A different way of approaching project delivery was necessary but still utilizing Prince 2 as the overarching project management methodology. An iterative agile process called 'Scrum' was selected over several alternatives because it was non-proprietary and 'Scrum' encapsulated lean and empirical philosophies. A pilot 'Scrum' project at Housing was very successful.

Housing has now been running the 'Scrum' agile project delivery process for over 2 years. During that time all software projects have been delivered on or ahead of agreed time frames. ICT staff, engaged in the Scrum process, became motivated about delivering value to the client. ICT staff morale increased which led to staff retention. Feedback from business units across the department indicates that the usage of Scrum is a success.

Lessons learnt from the agile rollout at Housing can be applied to almost any organisation but in particular public institutions where public servants must balance mitigation of risk with improving value for money in investments in ICT.

Keywords: agile, government, scrum, software.

1 Introduction

Projects at the Dept of Housing ICT branch followed the traditional Waterfall model where after a large upfront investment of business requirement gathering, coding and testing, software was delivered to the business. However, the Waterfall model did not suit the rapidly changing business needs of the Department's internal clients. Furthermore, most Housing ICT projects were not completed on-time using the Waterfall model.

After a raft of new major federal and state policy initiatives were announced it was obvious that a fresh approach to delivering software should be considered. The significant internal systems implications of the policy initiatives warranted a reassessment of the Waterfall model. The author was led to look at techniques employed by agile project managers in the software industry.

This paper outlines the steps the author took in introducing the Scrum agile process into the Dept of Housing and what lessons were learnt. Section 2 examines how Scrum became a potential solution for the ICT branch to the difficulties encountered with the Waterfall model. Section 3 details the pilot project the ICT branch undertook. Section 4 summarises the obstacles encountered by the author, mistakes in the implementation and the overall benefits the ICT branch gained. Section 5 lists lessons the author gained from introducing a new agile process.

2 Solution

A popular buzzword is "agile". Everyone wants to be flexible, after all no ICT branch really wants to be rigid and slow to respond. At the first board meeting of 2007 the Department of Housing Board of Management issued a statement that service delivery in Housing would become "more agile". This suited the ICT branch's purposes as agile project processes were evidently becoming more mainstream in the development community.

The only problem was that no one in the ICT branch really knew how to become more agile or whether they

were agile in the first place. The following agile methods were evaluated:

- Scrum;
- Lean development; and
- eXtreme Programming (XP).

The major criterion for the selection of an agile process was for the process to address identified issues and the respective ramifications as listed in Table 1.

Table 1 Project issues and ramifications

Issue	Ramifications
Inadequate requirements management	Business confidence in ICT branch very low. No forward progress, projects delayed.
Business analysts, developers and users/customers were not communicating effectively or regularly.	Increase of risk for the project.
Lack of project transparency.	Increase of risk for the project.
Testing phase squeezed in at the end of Development phase.	Quality control was undefined, increasing risk.

2.1 Why Scrum?

The agile process called “Scrum” was selected over the alternatives because it:

- Emphasized communication and collaboration, functioning software, and the flexibility to adapt to emerging business realities[1];
- Was not just relevant for developers but the entire project team; and
- Embraced agile philosophies such as the Agile Manifesto[2].

There were, however, no known Qld state government entities that used Scrum.

2.2 Integration of Scrum and PRINCE 2

An early issue raised by Senior ICT management was the perceived conflict between Scrum and Prince 2. Prince 2 is mandated by the Qld Government IT Office to be the standard project methodology for all projects to follow.

To gain traction with Senior ICT management the following messages were put forward by the author:

- Prince 2 is a best practice methodology for minimizing risks in a project.
- Prince 2 does not prescribe how to deliver the intended solution for the project.
- Within the Software Development Lifecycle, the design and implementation stages are cyclic when using the Scrum process.
- The usage of Scrum does not compromise the structured and process driven Prince 2.

The successful merging of Scrum and Prince 2 was a major selling point to Senior ICT management for the agile process.

A full discussion of Prince 2 and Scrum coexistence is beyond the scope of this paper.

2.3 Overview of Scrum at Housing

A pilot scrum project was endorsed by ICT Senior Management.

To prime both the ICT branch and business areas for changes a presentation was made to a number of groups (about 100 people in total) including ICT staff and internal Departmental business teams.

The author promoted Scrum and in general all Scrum teams at the Department of Housing ICT branch worked to the following approach.

Dispersed ICT project team members were co-located i.e.: sat together in close proximity. This significantly reduced communication issues listed in Table 1.

15 minute daily Scrum meetings were held, reporting daily progress and impediments for the ScrumMaster to remove. At 9.30AM every day, the entire team stood in a circle and reported progress by answering 3 questions:

1. What did I do yesterday?
2. What will I do today?
3. What problems are preventing me from making progress?[3]

At first new participants were dismissive of the value of the daily Scrum meeting. However the most cynical participants were always won over within 2 weeks. This happened as the daily Scrum meeting contributed significantly to uncovering and resolving issues quickly.

System development was broken up into multiple timeboxed “sprints” or iterations. The first Scrum projects at the ICT branch had 4 week sprints. As more

projects used Scrum, teams variously chose 2 or 3 week sprints. Some teams settled on 13 day sprints with 2 day break between sprints. This allowed for any accumulated flexitime to be taken during those 2 days. Sprints and daily Scrum meetings contributed to solving the project transparency problem (refer Table 1): At any time during the project, one could ascertain both the true progress and health of the project. Implementation, test and configuration plans were developed during the sprints.

Tasks were listed in a “Backlog” and successfully completed tasks were transferred to a Business Requirements Document as required by internal audit. Tasks in the “Backlog” were prioritized with the client’s input for the next sprint – only tasks of highest immediate business value were to be actioned by the Scrum team. The issues with requirements management had been solved (refer Table 1).

Working software was presented to the client for review and feedback at the end of every sprint. This was much different to the Waterfall model where quite often the client is first exposed to the product at user acceptance testing.

The Scrum teams held a performance assessment meeting (aka “Retrospective”) to discover ways of adapting and improving the team’s processes. This was held at the end of every sprint. Further to this a quarterly Retrospective meeting was chaired by the author with participants across all Scrum teams. Some of the results of this meeting can be found in Section 4.2.

2.4 Resources

There are 3 types of resources required for a Scrum project. All 3 types were mandatory on Scrum teams at Dept of Housing.

ScrumMaster (Agile Project Team Leader): The responsibilities of the ScrumMaster at Dept of Housing were two-fold; protect the team from outside influences that may distract the team from its sprint goals and; ensure the team is following the Scrum rules.

Scrum Team: Dedicated ICT professionals including Business Analysts, Developers and Testers. The Scrum Team met every morning for a 15 minute standup meeting. The team estimated and committed to those estimates together.

Product Owner: A representative of the client or business that is empowered to make decisions on their behalf. In the Waterfall model, there are potentially numerous stakeholders. The Product Owner is the one stakeholder the Scrum Team can rely upon to filter and prioritize all requirements. At Housing, this role was

usually filled by a Business Analyst or a dedicated resource from the Department’s internal business clients.

Larger projects were also staffed with a Project Manager (PM). However the PM’s tasks do not overlap with those of the ScrumMaster role. There is no team leadership for the PM, rather progress reporting to executive management, Prince 2 documentation and budgeting responsibilities.

3 Implementation

3.1 Pilot Scrum Project Description

The objective of this pilot project was to deliver a Web based application, that tracked and co-ordinated the workflow of documents, and captured compliance reporting information supplied by councils across the state. The application enabled the decommissioning of a number of disparate and geographically dispersed spreadsheets and MS Access databases, where information was often duplicated and manually re-entered. The application also provided operational reporting functions where appropriate, and provided a single source of data to facilitate future uploading to the department’s Data Warehouse.

The project also provided stakeholders external to the department’s Central Office, with access to council compliance information. It removed the necessity for various business units maintaining multiple information sources in parallel.

Finally, the system provided a mechanism to track interactions with councils, and allowed the maintenance of council and related parties’ details.

Estimated project length: 6 months

Actual project length: 6 months

Staff: 1 x Business Analyst, 1 x ScrumMaster, 3 x Developers

Technologies: .Net 2.0, SQL Server 2000, K2.Net, Web services

The project was deployed successfully within the original agreed timeframes.

3.2 Lessons Learnt from Pilot Scrum Project

The Scrum concept of releasing continuous business value delivered a very positive result. The usage of Scrum benefited the project in the following ways:

- Early release into production: Functionality was actually released into production after the 2nd

development iteration (“sprint”). Subsequent sprints allowed more features to be incorporated into the application.

- The project team was able to respond to changing requirements by allowing the client to reconsider the priority of tasks at the end of every sprint.
- The entire project was delivered to the client much sooner than other similar sized projects that are conducted using a phase-driven Waterfall methodology. A conservative estimation is that the project was delivered four months earlier (than would be the case under phase-driven methodology).
- Morale in the project team was high because team members were able to rapidly realise benefits for the client.
- Co-location of developers with the business analyst worked extremely well, enabling a high level of communication, cooperation, and motivation.
- Project reviews were conducted at the end of every sprint by the project team. This allowed estimation and procedures to be improved for the next sprint.
- The project’s Business Analyst doubled as a tester on a continuous basis. This extra workload convinced senior management to allot specialist testers to future projects. Continuous testing contributed greatly to the quality result.

3.3 Overview of Subsequent Projects

The successful implementation of the Scrum pilot project ensured that other projects were also earmarked for the Scrum process.

Housing ICT has now delivered 10 successful IT projects using Scrum. Two Scrum projects are currently in progress and another 3 scheduled to start in 2009. Each project had significant business impact and ranged from delivering new systems that encapsulated complex policy to upgrading legacy systems by integrating into the Housing Service Oriented Architecture. One of the projects was an operational upgrade of existing call centre software.

Six of the ten completed projects were of a similar or scale to the pilot project, 3 others would be considered smaller than the pilot. The largest Scrum project undertaken had a budget of approximately \$3M, involved a large policy update to 3 legacy systems and a new interface. This development phase of this project finished 4 months ahead of schedule.

4 Evaluation of Scrum

4.1 Obstacles

Not everyone was ready for Scrum. The idea of delivering working code in 2 to 4 weeks was very foreign to many developers. The idea of only gathering enough requirements for a short sprint was very foreign to many business analysts. These were ingrained mindset hurdles that needed to be overcome.

The intensity of the sprint meant uncommitted team members were soon exposed. The concept of “team players” was very real in Scrum!

A major dismissive attitude that prevailed was “it’s all just common sense anyway”. However, if it was all just common sense why hadn’t the ICT branch been doing it in the first place?

The sense that agile practices increase risk caused apprehension to adopting Scrum. If the Project Manager does not plan for every contingency before the project begins then what happens in the worst case scenario? For this the author had to point out that Scrum actually minimized risk by short-turnarounds and increased project transparency.

Another general criticism was that the term “agile” is a euphemism for “no documentation”. However in a government organization that is often subject to audits, the ICT branch required a full range of documentation. A major point of difference with Scrum was that only enough business requirements were gathered for the developers to start. The traditional protracted business requirements gathering phase was no longer required. It was mandated that all required documentation was delivered at project closure.

Organisational attitudes and culture was the main obstacle to the adoption of the Scrum process.

4.2 Mistakes

Retrospectives and post project reviews identified the following mistakes some teams made with Scrum:

Backlog was not adhered to within every sprint. When the developers had finished coding the user stories during a sprint, tasks scheduled for future sprints were brought forward and then the developers were expected to finish those tasks for the sprint. This presented risks that the developers were coding and the clients were not prepared to test those new items. This is not Scrum and led to chaos.

Production ready code should be deployed to Production as soon as possible. The Scrum process dictates that the team should only be working on user

stories that the client can use asap. This did not occur during one Scrum project. Admittedly this issue would have been hard to mitigate given the political nature of the project, however the project team felt that in hindsight it could have happened to some extent.

Team did not estimate tasks. Agile estimation has become a common activity on Scrum projects within the ICT branch. The project team did not undertake any estimation activities as a team and thus could not complete any metrics around team productivity improvements from sprint to sprint.

4.3 Business Benefits

While many of the projects resulted in measurable stakeholder ROI and tens of thousands of dollars in savings simply by completing within agreed timeframes, the longer-term benefits are harder to assess quantitatively. Yet, they exist and are clearly strategic.

One perceived benefit is that the Department of Housing is able to respond to Ministerial policy changes and social issues quickly thus becoming a more agile social services organisation.

4.4 Team Benefits

ICT staff that had actively used Scrum (30 in number) were surveyed on the following topics: Productivity, morale, adaptability, accountability, business engagement and the question as to whether to continue to use Scrum.

Across all categories, responses were extremely positive with the Morale and Business Engagement categories having what was the strongest response.

All staff agreed that morale was better or much better using Scrum than when ICT used the Waterfall methodology. This was an excellent result. It was concluded that Scrum had a significant impact in improving morale.

Lack of business engagement throughout a project was a common complaint in the past. Scrum solves this as close project team to client interaction is inherent in the Scrum process. Close business interaction is a requirement for quick feedback. The kind of feedback a project team needs is the answer to the following question: "Are we building the right product for the business?" Under waterfall there were few inherent opportunities to demonstrate progress but Scrum overcomes this with the notion that the project team delivers production-ready functionality at the end of every "sprint". Thus the business has the opportunity to answer the above question regularly.

All ICT staff indicated in the survey their desire to continue with Scrum.

Significantly the ICT branch retained all staff that had worked on a Scrum team for over two and a half years.

5 Overall Lessons Learnt from Scrum Rollout

The following is a summary of ten of the most important lessons learnt using Scrum in a government agency.

5.1 Agile Project Leader

Scrum teams need to follow the Scrum process closely. The ICT branch's teams learnt that sticking to the Scrum "rules" usually meant things just went smoother. After so many years of operating under phased-driven waterfall methodologies, the tendency when decisions needed to be made about resourcing or scope issues was to fall back to old ways. Scrum required a new level of discipline that did not seem to be necessary using waterfall.

Consideration must be given to a dedicated resource to act as Agile Project Manager or "Scrum Master" across several projects. Part of the Scrum Master's mission is to make sure the process is adhered to properly.

5.2 Focus is directly on team

Under the Scrum model, the focus for decisions, solutions and recommendations is with the team. A daily standup is used every morning to highlight issues team members are facing and it is up to the team to solve these. For example a business analyst may be facing an issue that a developer knows how to address and vice versa. The team estimates and commits to delivering working software at the end of every sprint. The author also enrolled all Scrum participants in "ScrumMaster" training – a 2 day practical course on running Scrum teams.

5.3 Sprint '0' a necessity

Sprint '0' ('zero') is the common name of the very first sprint. This unique sprint has no mandated deliverable but the team will use it to set the foundation for future sprints. For example the developers might research new controls or update the Application Framework. Sprint 0 can be the time for establishing the statement of business need and for the business analysts to start collecting enough requirements so the Scrum team has something to work on during Sprint 1. At any rate I do not set a mandatory time limit on Sprint 0 – it can be anywhere between 2 to 8 weeks. This is so that the team can be thoroughly prepared to begin sprinting.

5.4 Do not impose

It was noticeable that some Scrum teams matured faster than others. Those mature teams embraced Scrum and agile techniques and over time became highly productive. Other teams tentatively went about working out how they could use Scrum. For example, if one team utilised “user stories” and another did not, that was acceptable, as long as the basic tenants of Scrum were not compromised. There should be no problem with waiting until the motivation and the maturity is there so that new techniques can then be introduced.

5.5 Keep productive teams together

When a team had bonded over some months and spawned a group dynamic focused on delivering, it can be a mistake to break it up at the end of the project. Even if there is a hiatus between projects, the author attempted to keep the team co-located, together and possibly addressing support issues together.

5.6 Human interaction over technology

Although there is off the shelf software designed to track progress of Scrum teams, it can be preferable to keep it simple. For example, the author would utilize whiteboards (aka “Information Radiators”) and spreadsheets for backlog item tracking. If teams were distributed, the author would recommend consideration of agile progress tracking software.

5.7 Measure, measure, measure.

It can be very hard to prove that a project was successful due to Scrum. After all, the exact same project *might* have been successful using waterfall too. One way to convince senior management to keep using Scrum was to measure productivity of teams. The rate of delivery vs. the estimated rate of delivery over a number of sprints and across projects should improve with experience. Thus the author attempted to measure performance (aka “velocity”) of the teams. This also gives teams a benchmark to work with and estimation improves over time.

5.8 Focus on quality

Delivering working software to the client at the end of every sprint forced the ICT branch to improve quality standards. The addition of at least one tester as an integral member of the Scrum team from the start of the project became mandatory. Test Driven Development was encouraged, daily builds began and refactoring efforts became the norm. The lofty aim of each iterative release was zero bugs – teams did not want any Severity 1 or Severity 2 bugs to be “discovered” by the users.

5.9 Educate the client

The internal business units had little understanding of Scrum or Agile techniques. Ideally the ICT branch and the business should use the same agile process and thus are speaking the same language and working to the same sprint goals. Often project teams had to continually compel the business to work in with the project priorities. A recommendation is to spend as much time educating the business clients as spend on the ICT staff. This could involve organization wide education programs or “Scrum Master” courses.

5.10 Leadership essential

Finally, all organizational change management requires leadership and a steadfast commitment to improving work practices. Scrum is no exception.

6 Summary and Recommendations

Scrum is an iterative agile process that while aligning well with Prince 2, can bring significant productivity increases to project teams. The use of Scrum was a success at the Department of Housing. However even as a lightweight methodology, it requires much discipline.

Government agencies suffering from budget cutbacks but still mandated to deliver valuable services to their clients are encouraged to embrace agile delivery processes such as Scrum.

7 References

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