Applying Agile Business Solutions as a Graduate Capstone Project

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A graduate course was implemented to teach the fundamentals of Agile project management as part of the MS Technical Project Management curriculum. The course was designed to provide a solid foundation in Agile methodologies for project management practice to enable graduates to execute appropriate Agile techniques to plan, and deliver quality results that frequently deliver value to customers. During the course students are introduced to Agile processes which include developing user stories and story maps, estimate and plan for sprints, track project execution and releases using burn-down charts and conduct retrospective sessions. This paper discusses how a graduate student was able to successfully apply the Agile principles and processes learned in the graduate program to an Independent Study project designed to provide students with the opportunity to apply their knowledge and experience gained during the curriculum to addressing and solving a real business problem. The student chose to develop and implement an Agile framework solution to a software implementation and performance problem his business organization was facing.

Keywords: agile, project management

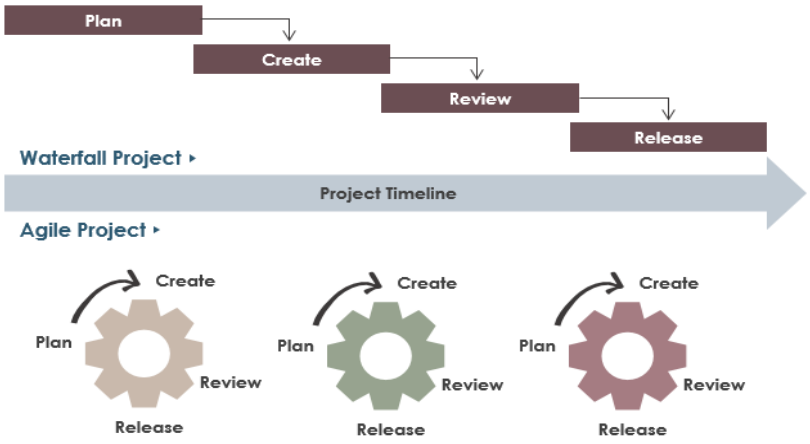
INTRODUCTION

Expectations for graduates entering the project management profession are changing and intensifying to meet the complex needs of society. Global issues, technological innovation, blending of discipline boundaries, and increased professional complexities are transforming how project managers elicit and analyze customer requirements to develop and deliver effective solutions. Societal demands are requiring that project management graduates possess technical knowledge and the ability to think creatively and critically, effectively communicate, and work in teams to solve challenging problems. Many contemporary problems project managers face are considered multidisciplinary in nature making it clear that academic

programs must educate students to work on projects characterized by flexible scope, adaptive scale and changing complexity. Continuously changing technology and industry demands are influential factors in education. The project management profession relies upon practitioners with the skills to innovate and effectively compete, and towards meeting those needs academic institutions are expected to provide a curriculum that introduces students to appropriate techniques for successful transition into productive careers. As a result, academic institutions are challenged to adopt appropriate strategies to meet innovative educational demands from both students and industry (Rabb, et al, 2019).

Many projects have traditionally been managed using a waterfall or predictive methodology whereby a detailed plan is developed then executed to deliver project benefits. This works well when requirements and scope are clearly defined for the project with all activities flowing logically from the beginning of a project through the end. It is not uncommon for project managers to be faced with poorly defined requirements and ambiguous scope and a customer looking for the project manager to help them define what the deliverables should be in terms of specifications and performance. As projects grow larger and become more complex, requirements often become more ambiguous, and significant project issues can occur to include cost overruns, delays, and project failures. Applying waterfall planning and execution under these circumstances becomes difficult and what is needed is a project planning methodology that embraces change and complexity and that is adaptive to scope change. This is where the Agile methodology can be a valuable tool for project managers (Greenburg, et al, 2022). Agile is an iterative approach to project management that helps teams deliver value to their customers by delivering work in small increments. Requirements, plans, and results are evaluated continuously so teams have a natural mechanism for responding to change quickly.

FIGURE 1
COMPARISON OF AGILE TO WATERFALL PROJECT METHODOLOGIES



The project discussed in this paper involved a business that recognized it needed to produce shorter delivery times and improve its value. After being exposed to Agile processes it became apparent to the student that employing an Agile methodology could help shorten the system implementation process his organization was experiencing while preserving the integrity of the delivered solution. Employing Agile methodology to reduce the time to delivery and the realization of benefits is becoming more prevalent (Fair, 2012).

Defining business problems and developing solution is an important component of effective project management and managers should lead change, not be led by it. Agile works well in complex situations where requirements and scope are evolving because its focus is on developing the project as an iterative process rather than a pre-set plan. Agile supports the iterative release of useable functionality that enables the project team to show the client value creation incrementally and, as the project progresses, a greater

understanding and definition of previously "fuzzy" information becomes clearer. One of the fundamental tenets of Agile is a phased approach that supports the client becoming an integral part of the design, working with the project team more and more as the project progresses and being able to see and comment on what they are receiving (Vandersluis, 2014).

This paper describes how the Agile concepts learned in a graduate technical project management class were applied by a graduate student to identify and develop an Agile solution to a significant business problem his organization was facing.

BACKGROUND

[The company] where the student is employed is a growing manufacturer and distributor of performance-based apparel incorporating two brands for the fishing and hunting industry. It is owned by an aggressive investment group that operates and enforces lean personnel operations to maximize its profits. With as little as twenty employees, the company manages current operations at an estimated evaluation of $250 million. Each department in the organization has no more than three individuals managing their functional area of the business. The company's lean approach to staffing resulted in a relatively small team performing the majority of the business functions. The organizational structure based on a small team lent itself to employing Agile processes.

Since its founding in 2013, [the company] has leveraged global manufacturing sources to achieve a 35% year over rear growth rate in sales based on internal sales report analysis. The company emerged out of the startup phase in 2018, by engaging with independent dealers, developing direct to consumer business, supplying to Amazon and its own chain of retail stores. Core to the Agile values and principles is a focus on the customer (agilemanifesto.org). By adhering to this philosophy the company became a leading market competitor and was able to consume up to 50% of its competitors retail space in big box and independent stores based on customers internal reporting methods. Based on predictive analytics [the company] anticipated continued growth at the same rate for the foreseeable future.

During the 2015-2020 period, [the company] employed the Oracle NetSuite business software system. The NetSuite software was utilized for storing seasonal standardized product costing, inventory control, allocation procedures, accounts payable and accounts receivable (AP/AR), and purchase order generation. It was generally recognized that NetSuite met the requirements of [the company] on all facets required to maintain and operate the business.

The investment group and upper management's emphasis on lean methodologies to maximize profits resulted in the development of Cross-functional, self-empowered teams. Many of the employees engaged in day-to-day operations experienced a significant level of expanded job responsibilities compared to the original job descriptions, roles and responsibilities they were hired to perform. The increase in employee's roles and responsibilities resulted in employees being expected to perform business functions that in most cases they have not received formal training on how to perform. This increase in work stressed employee performance and adversely impacted morale.

PROBLEM/CHALLENGE

As [the company's] growth rate continued so did the requirements for data analysis to support business decisions. At the experienced level of growth a miscalculation in the organization's data collection and interpretation can lead to significant impacts such as missed sales and excess inventory levels. Also, inaccurate cost estimates result in poor operational budgeting leaving the business in a potential cash flow bind. Project risk is a critical factor in estimating the project budget and studies have addressed the need for cost estimation methods that consider identified risks (Kwon, et al, 2019). Miscalculation in allocation estimates can adversely impact weekly or monthly sales numbers which negatively impact the bottom line.

In keeping with their lean philosophy upper management determined in 2020 that the NetSuite software the company had been using was too costly, and a decision was made to find a more cost effective operational software with a smaller financial impact to the businesses bottom line. In the first quarter of

2020 the chief operating officer at [the company] selected a new software called A2000 which came with a significantly lower licensing cost than NetSuite and was thought by upper management be a viable option to meet the requirements of the business. It is important to note that the decision to switch operating software was made at the executive level without input from the functional users in the organization.

In comparing A2000 to NetSuite, A2000 in concept possessed the same operational functionality as NetSuite, such as storing seasonal standardized product costing, inventory control, allocation procedures, AP/AR, and purchase order generation. In reality, A2000's user interface was harder to use and it took users two to three times as long to complete business processes, generate reports, and aggregate data due to poor software performance. It quickly became apparent to users that A2000 was ill equipped to handle the functional staff business needs. As a workaround to the difficulties of learning and employing A2000 users began relying on Excel spreadsheets to perform some tasks that should have been done in A2000. Employees found it hard to manipulate data inside system so the data was exported into excel and manipulated. The continued growth in the size of data sets that needed manipulation exceeded A2000's and Excel's performance capacity and greatly increased the time it took to perform data collection, analysis and reporting. Because it was necessary for employees with varying level of Excel expertise to manipulate the A2000 data there were frequent cases of misinterpretation of the data.

A key aspect of the Agile process is conducting retrospective sessions. These sessions are held at the end of an iteration or activity, such as the A2000 implementation. The purpose is for the team to reflect on what happened with an eye towards identifying actions for improvement going forward (Przybylek, et al, 2022). Retrospective sessions revealed that in post software implementation the constantly changing reporting formats caused confusion in reporting and hampered the ability of upper management to make effective large-scale decisions. This lack of accurate data handling and analysis resulted in all day meetings with functional managers from all departments to interpret the data being assessed.

By late 2020 the increased processing time coupled with continued sales growth and the lean staffing began to manifest itself in poor employee performance and moral. It became apparent to management that the continued success of the organization depended on reducing the adverse effects A2000 was having on employee workloads and day to day operations. Each department at [the company] had manual processes that were time consuming when utilizing the A2000 software and Excel. The production department was identified as a priority for improvement. As the leanest team they spent a substantial amount of their daily work hours to assure that key metrics in product cost, garment quality, and delivery times were optimal. Under A2000 all processes related to the production department required additional manual data input and analysis making, timely vendor interactions difficult. As the driving force of the company the production department needed a tool to store all production related data, automate production orders, develop standardized WIP tracking, auto generate shipping documents, and automate the receiving of goods into separate digital warehouses to protect inventory for each retail channel.

Functional staff increasingly voiced the need for an efficient, easy to use interface to A2000 using standard query language reporting and automated processes. It was argued that standard query language reporting would enable standardized reporting and improved business processes with real time information for all functional managers and staff.

RESULTS

At the end of the second quarter of 2020 based on the recommendation from functional staff, management directed the IT and Production Operations departments to collaborate daily in a small, cross-functional group (Scrum Team). Their highest priority was to satisfy the needs of employees who were the primary users of the software. The Scrum team worked to develop a web based Standard Query Language (SQL) overlay software. The overlay was intended to be used internally by functional staff and externally by vendors, manufacturers and logistics providers. As such the overlay had to be fully compatible with A2000 to automate standardized reporting and business processes. To reduce risk, the team employed a two stage strategy. First, they worked to automate as many standardized reports and business processes as possible. Automation would increase code quality and reduce human error. Second, they instituted an

incremental delivery approach which would leverage the automation and test small bits of completed code. A key objective of the project was to reduce data errors and the amount of time it takes the functional staff to develop reports and reduce time in day-to-day business functions.

Targeted business functions for improvement included production, sales operations, accounting, warehousing, allocation, and vendor communication. By utilizing SQL coding, the allocation team was able to develop its own custom algorithm to generate order status updates in as little as two hours instead of an entire workday. The production team took the incentive to learn how to write SQL code that would integrate product demand and lead times to auto generate purchase orders and send them to vendors due to the level of intricacies. This action by the scrum team truly embodies the Agile principle of building projects around motivated individuals and giving them the environment and support they need, and trusting them to get the job done. The sales team partnered with IT as a product owner to aid in the development of the code that processed historical and real time data to aid the design team in creating future products that would perform well in the current and future markets.

The specific solution was developed using a web-based platform or dashboard with permission limitations for internal users at [the company] and for external users such as manufacturers and logistics providers. The IT and Production Operations department identified that to train the functional staff on the newly developed tools on the job training and training manuals needed to be developed. To address the training requirements and enhance agility the development team created a standard operating procedure library with dashboard hyperlinks illustrating how to use the new tool and document which data sets are being displayed.

The implementation of SQL reports and workflow processes automated the collection and integration of data from A2000 data tables. This greatly reduced the time required for; analysis and validation of data, procurements, and monitoring Work-In-Process. The automated business processes enabled the real time analysis of sales data to determine market trends and inventory levels, and determine the best allocation outcomes and supply chain monitoring.

At regular intervals, the team reflected on how to become more effective, then made adjustments to behavior and processes accordingly. During the development effort IT and Production Operations held regular meetings with internal and external business functions in the organization to determine which reports and or business processes are taking large sums of time to complete or are inaccurate due to data discrepancies. Meeting assessments determined if SQL code could be written to improve these reports or business functions, and how they could be entered into a prioritized backlog based on value added to the company. Once the backlog was prioritized the IT and Production Operations team determined the appropriate work structure and flow to complete the tasks at hand.

The development team was able to create a web-based platform and or dashboard where all SQL reports can be stored and accessed by functional staff. Applying a key tenant of the Agile Manifesto is "Business people and developers must work together daily throughout the project." The product owners and users were involved in design of reports and business processes and well as detailed standard operating procedures and a step by step how to library on how to utilize the newly developed tools. The IT and Production Operations department developed formal meetings, training sessions, and "how to" libraries to hold employees accountable to use the improved applications provided to them.

The use of SQL coding to develop a web-based overlay of the A2000 operating software enabled standardized reporting and business functions which significantly increased the productivity and morale among [the company's] workers. An anonymous survey submitted to functional employees estimated an average increased productivity percentage of 90% of employees, an increase of morale by 100%, an average time savings of 3.5 hours a day and an improved data accuracy of 95%. Applying SQL web-based overlays to A2000 software has been a monumental success for [the company] and will continue to be applied based on the growth and complexity of the business as it continues to grow in the market of competitive fishing and hunting apparel. IT and Productions operations will continue to partner with functional managers and staff as product owners and data analysts to improve the turnaround time of developing, validating, and published a work or business process.

LESSONS LEARNED

In a small team environment employee training is critical for achieving optimal sustained performance. The [company's] history of increasing employee's roles and responsibilities resulted in employees being expected to perform business functions that in most cases they had not received formal training on how to perform. This increase in work stressed employee performance and adversely impacted morale. An effective initial and refresher training in processes and tools can have a positive impact on employee performance, health and morale.

As transparency is a key component to an Agile workflow (agilemanifesto.org) the student was able to convince upper management that not only being transparent about the software change, but also why the change happened would lead to more engagement from middle management and the functional employees. Additionally, upper management learned that having realistic expectations of switching operating software would keep moral high during the migration, as unexpected data discoveries would occur. It was identified that a learning experience time frame would need to be established where work would be duplicated in both software should another software migration occur. This would allow for middle management and the functional class to operate smoothly in the old software while learning the intricacies of the new software.

At the beginning of developing reporting methods and business function tools, the IT and production development team failed to communicate and solicit input from the business function groups. This led to ineffective reports and tools that the business function groups found cumbersome to use.

The Product Owner is an essential role to the success of an Agile project as they are central to all decisions and represent the interests of the customer (agilemanifesto.org). It was determined that identifying a product owner led to the success of developing reporting methods and business processes as the data integration and display would need to be validated by an individual familiar with the data and that they would need it designed in a way that would be easily represented to upper management.

Collecting initial requirements and executing standard query language reports and business processes and distributing to the team at times led to less-than-optimal outcomes as requirements would change frequently based on demands from upper management. IT and production operations found that delivering increments of the new report or business process would provide incremental batches of value to the functional staff but would also allow for flexibility before the code was completed and distributed to the entire company.

Applying an iterative and incremental approach is the essence of Agile and also reduces the risk tremendously. The IT and Production Operations team determined that ongoing feedback from the functional team led to the most value added to standard query language reporting. Much like an application or a website there is always room for improvement, such as operating speed, additional filters, downloadable functions, push notifications, and version saving for example.

Selecting and implementing the A2000 system without adequate coordination resulted in work backlog and employee frustration. The [company] should have conducted a retrospective sessions at defined points in the system replacement and implementation process would have helped to identify the root performance issues and allow development of course-correction actions to be taken sooner.

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