A Framework for Developing an Assessment of Industry Based-Learning Outcomes Using Agile Pedagogical Methods to Deliver Content in an Undergraduate ERP Business Course

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Abstract
This study focuses on the development of an assessment framework tool for improving ERP student’s comprehension of ERP applications that match industry requirements. This paper illustrates how to improve student knowledge and assist the teacher in better understanding their students’ mastery of ERP by using an Industry-Based assessment framework tool. The research completed in this study, including the review of literature supports the idea that there is a need for a more complete assessment of ERP skill sets and that these skill sets should best represent industry needs. We propose that an assessment framework tool can incorporate in the ERP education agile practices to improve teaching effectiveness and facilitate learning of critical concepts. The essence of this model will attempt to concentrate on literature review and data collection.

1. Introduction

A number of companies that create and market ERP systems have initiated arrangements with universities to incorporate ERP concepts and techniques into business classrooms in efforts to better prepare the next generation. There is a strong demand in the market place for students prepared with ERP knowledge and skills. We propose that an assessment framework tool can have a significant positive impact on the outcome desired. The focus of this paper is to describe how an assessment framework tool can be used to improve student understanding and assist the teacher in better understanding their students’ mastery of ERP.

This paper proposes that there is a need in academia to evaluate the methods used for effective teaching of ERP concepts using ERP software in the classroom that should reflect best practices of industry. An increasing number of business schools are using software employed in business practice in an attempt to teach business process. (Wagner., 2000) (Corbitt & Mensching, 2000); (Nelson & Millet, 2001)

A framework for an assessment of ERP in the classroom is not currently available. The researchers will attempt to build a consensus from previous literature research reviews, interviews, instruments, questionnaires and focus groups to derive an overall understanding of the key aspects and factors of ERP Assessment. The process will be done utilizing the agile methodology. The focus will be on expected benefits of ERP assessment based on skill set of students from industry requirements.

Having ERP in the classroom provides an opportunity for academic entities to develop a competitive advantage over competing schools nationally and internationally in preparing students. The review of ERP enterprise systems assessment in the current literature is limited and many papers recommend this area for further study as seen in the call for future research from Fedorowicz, Gelinas, and Usoff paper titled; “Twelve Tips for Successful Integrating Enterprise Systems Across Curriculum” They state: Little research has been published that measures the effects on students understanding of course material and their broader knowledge of business issues. This paper proposes that an assessment will allow for greater, more effective and efficient results in evaluating the teaching and learning of ERP in business classes.

2. ERP In Academia

Using the ERP software in the classroom can help students learn skills and provides a better understanding of the way functional areas in business are dependent on each other for accurate and timely information. There are numerous reports about the integration of ERP software into undergraduate business curricula and about the potential value of such initiatives in promoting cross-functional understanding of business processes. [1] (Becerra-Fernandez., 2000) Today corporations solve business problems using technology to connect business processes and functional areas.[2] (Kobayashi, 2003). Bringing ERP (Enterprise Resource Planning) software into our classrooms has allowed us to provide our students with the most comprehensive software that is used in our local industries.

ERP Systems have become so widespread that they are difficult to ignore, if academics want their teaching and research to be relevant [17]. (Scott, 1999).

3. Assessment Critical
Because of academic and industry arrangements students are able to develop ERP skills that are highly valued by industry recruiters. This ERP experiential learning experience strengthens the students understanding of business and computing concepts, principles and decision making. There are different types of ERP manufactured software systems available for students to learn in various university disciplines representing functional areas within a company. Using ERP in the business classroom enhances the credibility of the business school in the eyes of industry. If the ERP system package is used worldwide it contributes to attracting foreign student’s interest and provides significant potential for recruitment for traditional and online forums.

The partnership between professors and industry leaders in creating, redesigning and assessing the input, process, output and outcomes creates a benchmark for success. This is why assessment is critical to helping academia stay in range of industry accomplishments not at the “glacial pace” of yesteryears. There however does not appear to be a universal assessment or standard framework for confirming the successful objective of matching outcomes with industry needs. Accordingly, each academic entity will have to evaluate their local industry needs and assessments should reflect these needs because they will be different based on the territorial differences of industries represented. Industry needs will vary so should the academic offerings.

We propose that an agile approach to content delivery offers the best possibility for academic success for students, and any assessment framework must be structured from this perspective.

4. Agile Content Delivery

Agile methods will allow for the adaptation of both internal and external entities, deliver high value and functionality on a regular basis and build on continuous inputs with feedback and check points. Agile methods of course content delivery will be an important component in successful learning outcomes. Consequently, although the goal of this assessment is to structure a framework for industry-based outcomes, we believe that agile pedagogical methods are important for achieving these outcomes. Agile methods have been used in different types of projects and lean manufacturing in ERP is considered in industry. The study reviews the agile approaches to assessment in education verses the traditional assessment approaches. We attempt to use agile principles in this assessment framework including lean, flexibility, and agility. The framework proposes the assessment model to be lean in the elimination of wasted time and resources in gathering data and information required. With the ever changing business environment this assessment will allow for constant changes in industry needs by being agile and lean. The framework assessment tool will include students and instructor’s communication, feedback and a comprehensive adaptive toolset that will be most efficient and productive in meeting the goals of the requirements.

Scrum is an agile process that can be used to manage development using iterative and incremental feedback mechanisms. Using inspection and adaptation to attain goals with transparency engages everyone in identifying obstacles [26]. The student activities would be completed in iterations with constant feedback. These daily or weekly meetings with students during class time are to communicate the status of their progression which is part of the inspection process. Students will present on what they have accomplished since the last class, what they will accomplish before the next class and what obstacles are in their way of meeting these goals. Students convey comprehension of activities in assignments, exercises, tests and reports per the course syllabus.

As with the agile model, feedback is an important component of active learning methodologies. This “learn-by doing ”aspect of active learning, activities that incorporate student participation in instructor-guided hands on activities, allows for feedback to the instructor to determine understanding of this material.

The Scrum agile principle of urgency (in submitting assignments), sharing (student pairing) and communication (instructor-customer feedback) provides a good choice for managing classroom activities. This would be mirrored in the creation of the assessment tool by acquiring data information from industry through the measure previously described that would include urgency, sharing and communication.

Planning, coordinating and communicating within the class for both student and instructor provide control through inspection and adaptation. The short bursts of hands on work by students are created and build upon as in a backlog of required submissions. The inspection is based on the class test, exams and exercise that review previously acquired knowledge in a unit type test scenario specific to the functional submission.

The core principles of XP that would apply [27] in this situation includes the planning game scenario where students would produce the maximum value of work featured in the assignments. Students would through their completed assignments help instructors develop estimates of how long each assignment would take for full comprehension. These small releases of work by the student in completion of the progression time line based on their simple design will incorporate continuous testing until full understanding is obtained. Pairing of students is critical for speed of this hands-on learning in the production of acceptable assignments on time. The XP values of simplicity, communication and feedback are critical to the success of this tool. Having the instructor (customer on site) allows for continuous access to requirements in accordance with the fulfillment of the course objectives. Similarly in surveying industry (the other on site customer) for the assessment tool data we will have access to industry standards. The valuable nature of industry input in small iterative increments continually allows for the most comprehensive agile assessment
available of this database acquired skill sets for our students. Utilizing refactoring in the classroom to modify or restructure exercise, assignment and material based on student understanding achieves agility. Having information radiators throughout the course, introduced as a solid theoretical framework in Agile Software Development by Alistair Cockburn [29], will display critical information requirements to fulfill the objectives of the class. The display of this critical information is in the form of the course schedule requirements and syllabus, for everyone to see as often as needed. In the syllabus and course schedule the backlog is described in the form of small sprints of required activities that build upon each other and completion of those ahead cannot occur without fulfillment of the backlog. The goal setting of students completing these sprints (exercises, assignments) is the most critical success factor. The exercises, assignments, sprints or tasks that can be considered as stories are created to initiate critical thinking and decision making opportunities for better understanding. Preparing for the next story, sprint, exercise reduces waste. The stories are completed in entire themes representing functional areas activities in a module. Smaller stories are estimated within the functional areas to encompass the entire theme.

The benefits of combining XP and Scrum in this agile framework development include [28] the control mechanisms of Scrum and the scalability of goal directed iterations. This model will illustrate how agile practices can influence the nature of the outcome.

The proposed assessment will include the evaluation of agile content delivery methods which would embrace industry change and be flexible to changing material used in student comprehension of concepts and theory. The assessment is created based on a plan driven by activities the students complete in the class lab that builds upon each other. Both the class activities and the creation, formation of this framework assessment tool are proposed using the agile principles.

5. Agile Student Learning and Framework Tool Assessment

The Agile Manifesto areas specific to this framework will include identifying individuals and interactions over processes and tools. In efforts to be most effective and efficient in facilitating learning, the focus is on how the student comprehends the progressive steps and what pedagogical methods are successful. Students will be engage in learning the ERP concepts via the syllabus specific to the course but this syllabus will be in accordance with the interactions and completion of the module requirements. While growth for students will be in the interaction with the instructor the agile assessment configuration will be based on responding to customer feedback (the industry) rather than following a plan. The agile specific components of this framework would illustrate how the instructor and students welcome and adapt to changes during the semester. Agile pedagogical methods use problem solving and successful response to change as an opportunity to facilitate learning and better develop marketable skills in the students.

The course structure requires from students, working deliverables (module assignments) over short periods of time, repeatedly during the semester allowing for frequent feedback. Instructors guide problem solving by the students experimentation in decision making. There is an iterative requirement of exercises due periodically that provides confirmation to the instructor that the student comprehends the activity they just performed. These submissions are the primary measure of the student’s progress in completing modules assignments required. The systematic description of the knowledge progression timeline of student required activities for the entire process is described as a road map or knowledge progression timeline.

Students are required to pair with each other or form small groups to work on their module assignments resulting in better understanding for both involved. In this cooperative learning environment students actively seek guidance from the instructor and paired partners resulting in the skill sets needed for life-long learning. In designing specific module exercises and assignments problem solving, opportunities exist to prove technical competency that enhances learning.

Understanding the problem and coming up with a solution using the database is essential. After each functional module assignment completion of regular intervals, the students and instructor reflect and offer feedback on how to be more effective. All stakeholders (industry) shall adjust accordingly to the goal of capturing what best practices in industry should be the measured against the students skill sets acquired in the ERP class.

Much of the research has shown a strong association between heightened student learning and formal and informal faculty student interaction and contact. [31]

When students are actively engaged in the college experience, learning and retention are more likely [32].

6. Agile Teaching Objectives

Agile teaching incorporates constant communication and feedback between students and the instructor with the flexibility to respond to the dynamics of changing student needs. This allows for a goal driven relationship as opposed to a plan-driven contractual relationship as seen in more traditional delivery methods. By its very nature, the use of ERP software in a business is such an inherently hands-on environment, that agile content delivery methods are almost a necessity. We expect the results of any assessment to reflect that the use of agile methods in such cases will be superior achieving learning outcomes.

In the study, “ Evaluating Agile Principles in Active and Cooperative Learning” [30] the authors review of the literature on “ agile and active/cooperative learning literature showed parallels between the utilization of agile
methods in teaching (pedagogical methods) and active/cooperative learning techniques commonly found in the education literature. They propose that each of these components complements each other, and that using agile methods of delivering the material combined with active learning activities, leads to improved learning outcomes and higher levels of student engagement and satisfaction” [30]. As described in their paper we will also explore the use of agile principles in the development of pedagogical activities to facilitate learning by mapping the ideals and principles of the Agile Manifesto to pedagogical methodologies. We too will use our framework to suggest practices that can make ERP teaching more agile and, therefore, more student-centric and effective.

7. Objectives of Framework

The objective of this study is to 1) Structure a framework to assess the success of industry-based student learning outcomes in ERP training and 2) Determine the degree to which agile teaching methods contribute to this success. The study will provide evidence of the need and purpose of agile methods in ERP training. Using a value added consideration, the formative would assist instructors in determining how to improve and the summative would provide information for decisions on instructor/student performance. The study would reveal measurements and guidelines for meeting the needs of our students in obtaining best practice skills similar to industry. The assessment will be consistent with course objectives, learning outcomes and appropriate student educational goals. The framework will include course program educational objectives, student outcomes, performance criteria, and evaluation.

A framework objective would be to identify a clear skill set that takes advantage of the technical and knowledge management skills acquired from ERP courses relative to business process and analytical comprehension. Preparing this in the form of clearly defined stories from the customer (industry) should make it more successful.

The students will acquire a mix of managerial and technical talent necessary to compete in the workforce. The purpose would be to prepare the student to contribute to an organization through continuous delivery of course components that reflect competence of the material. These competences would be derived from the industry feedback previously described.

For this assessment framework we would include the input, processes, outputs and outcomes of ERP in the classroom. The assessment of inputs and processes in this study will establish the capability or capacity of a specific program or course. The assessment of output will serve as an indirect measure of effectiveness in using ERP. The assessment of outcomes will provide for direct measurement of the effectiveness of what has been done with that capability related to individual student learning and growth. The benefits include full time employment opportunities for recent graduates and would include an ERP program that will elevate enrollment of internships, on site seminars, workshops, training and will build industry ties. [16]. The framework will include the F.A.M.O.U.S assessment model in using knowledge management (KM) and data driven decision making (DDDM) based on a needs analysis. Included will be qualitative data received including learning objectives, validated student instrument [18], validated industry instrument, results and decision considerations which will lead to the cycle of continuous improvements.

The hypothesis could potentially include based on the outcome of this study, the negative effects of not having and ERP assessment. This research poses the question whether an ERP assessment framework would create a more effective and efficient process of matching industry demand with student acquired knowledge and skill sets. Having clearly defined goals for this assessment will provide a better chance of the success of this study. Goals that are specific to industry requirements and student preparation.

We began this research with a number of exploratory interviews in an attempt to better understand the issues prevalent in ERP assessment in business classes as well as avenues of assessment used in academia. The study will include Focus Groups Discussions (FGD) and In-Depth Interviews (IDI) of industry professional and academics. The collaborative nature of this project with students and industry (both customers) and the parallels between agile software development and active learning, values students and teachers interaction in accordance with the need in industry for these ERP prepared students. To assess if we are currently offering this type of end product is the kernel of this investigation. The results will be based on this empirical and experimental research study proposed.

8. Industry Input for Agile Assessment

Most research on ERP in the classroom is the results of remarkable strides SAP has made in academia and what has been received with the inception of using the Visual Info product in the ERP Intro classroom at Farmingdale State College (FSC). There is a great demand in our industry for students that come prepared ERP skills as indicated by local industry responses. Their preparation and capability to immediately use ERP has proven favorable to the local workforces as exhibited recently at the ERP Alliance Networking Event at FSC.

The input for the empirical and experimental study will be based on the agile principle similar to what is being used, considered and practiced in the ERP course referenced herein. There has been industry input as referenced below.
Based on responses stories will be created with iterations. Interviews have been completed and more are scheduled, additional surveys will be completed, focus groups with be conducted with feedback and direct measurable correlation to assess student’s skill set requirements compared to industry needs.

We first started with surveying the current industry market about their ERP use. In collaboration with the APICS NYC-LI ERP User Group, [http://www.apicsnyc-li.org/resources/forum.html](http://www.apicsnyc-li.org/resources/forum.html) of which the writer is a committee member and committee founder, a survey was submitted to local industry, titled APICS ERP Planning Survey which requested answers to 12 questions about local industries ERP experiences [30]. This survey included questioning the local industry about their ERP use including,

- their size,
- industry type of company,
- job function,
- number of locations,
- where locations are,
- at what stage they are with their ERP implementation,
- which ERP system they use,
- how long has their ERP been up and running,
- their cross-functional collaboration identifications,
- identifying critical functions that are actively involved in the development or continuous improvement of the ERP system in their organization,
- what the three biggest problems they have experienced with their ERP system, factors of their ERP software, and
- how they did or will measure the ROI (Return on Investment) for their ERP system?

The results indicated a vast difference in experiences. These questions and answers provided give way for the foundation of the new industry survey titled, “ERP Skills needed by College students for job opportunities in Industry”. This additional survey will be created and conducted about ERP student skill sets need for opportunities in the workforce. The writer is the executive vice president of the APICS NYC-LI Chapter, (Association of Operation Management formerly known as the Association of Inventory and Production Control, in existence for 50 years) [http://www.apicsnyc-li.org](http://www.apicsnyc-li.org) and has access to industry entities to help facilitate this information. This avenue of assistance is critical in performing these tasks to best represent industry information.

Collaboration between industry, academia and APICS is strikingly important to this author.

Industries involvement is critical to developing curriculum and hands on activities in the classroom that best reflects what student will be doing when employed in the workforce. That is what has occurred in this ERP course at FSC. In collaborating with industry on design of curriculum and classroom activities she believes she is getting closer to identifying the true needs of industry for ERP prepared students.

Industry has recently validated the works of this ERP class by awarding the BUS313 course at FSC with the prestigious Progressive Manufacturing 100 award for 2010, [http://www.managingautomation.com/awards](http://www.managingautomation.com/awards). FSC is the only academic in the winner’s category. “The Progressive Manufacturing idea has captured the spirit of an industry that is in the throes of dramatic change,” says David R. Brousell, Editor-in-Chief of Managing Automation and a Progressive Manufacturing judge. “Innovation, invention, and new ways of thinking about the business of manufacturing are picking up steam everywhere. The expansion of the Progressive Manufacturing Awards Program pays tribute to this important trend.” [35]

9. Conclusion

The goal of the assessment framework is to validate what is done in the classroom, determine what needs to be taught, and how it is delivered, determine learning outcomes and determine how the resulting student skill set closely represents and reflects the needs and expectations of industry.

This framework will enable instructors to know that in the preparation of their courses, lectures, exercises and assignments they are compliant with a standard which best meets industry practices. All students who take an Intro to ERP class in Business Management should have the same or similar qualifications as they apply to and start working in industry. That regardless of the manufacturer of the software or the university the outcomes should be the same.

The literature, experiments in the class, surveys, interviews and focus groups will attempt to support the hypothesis and questions posed in this study. The framework is being built based on the literature, class activities and industry responses to what is perceived to be needed. This research seeks to build a framework for being more efficient and effective in the assessment of ERP learning and teaching in an Intro ERP course.

The data along with the literature used to support this hypothesis brought forth the need for this assessment framework tool. The model proposed utilizes agile teaching methods as a basis for an effective and efficient process for gathering and analyzing data that will lead to better prepared students and instructor lead courses.

The practical application of this assessment could potentially benefit universities, students, professors, software manufacturers and industry.

We desire to establish that this framework for assessment will improve the ERP learning and teaching in Business ERP introduction courses through the development of this tool using agile methods represented herein.

The culmination of the aforementioned efforts will bring about a standard for ERP assessment that is absolutely
essential for the work of this author. This work is seen as a crucial part of identifying, confirming and justifying what should be taught and learned in an ERP Intro course that best represents industry needs.

References

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