Developing an IS as a New Business

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Extended Abstract

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1. Introduction

Information Systems have come to play an increasingly important role in every aspect of our personal and professional lives. The idea of Information Technology as an isolated tool, used for the sole purpose of providing operational support in organizations, is fading away. Organizations have come to see Information Systems (IS) as a core aspect of their businesses, essential not only in supporting operations, but also as part of their products and services offerings [1]. Despite this, ISs failure rates remain consistently high and many of these systems end up not being used or otherwise not delivering on expected value [2]–[5]. Our goal here was to better understand the problem of ISs projects failure and to propose a solution to increase ISs success and value delivered to customers.

On a superficial level we identify the problem as consisting in the high failure rates for IS development projects. A closer inspection, however, reveals the definition of success for IS projects to be a tricky concept. Most of the time this definition defaults to the standard used in project management in general: the iron triangle of cost, time and scope. Some authors recognize, however, that a project can still meet the goals defined for these three criteria, while at the same time not being used by customers, not liked by sponsors and not beneficial for the organization. Having this in mind, we define the problem in the following way: by relying on traditional project success criteria, the prevalent IS development methodologies do not help in guiding development efforts towards increasing the value created by the system.

Approaches to the problem of how to best develop Information Systems are usually described as development methodologies or practices. We cover two major approaches: the plan-driven approach and the agile approach. Inside the plan-driven category, we explore a proposal that explicitly deals with the problem of guiding development efforts based on the value of the system being developed.

We argue that a solution for this problem should provide a definition of IS Value that could be incorporated in the success criteria for IS development projects, and that it should also provide a methodology that uses the new project success criteria to guide the development process. Our proposal can be described as an IS development methodology, based on Scrum, that uses a measure of IS Value to guide the development towards increasing the value delivered to customers. We use DeLone and McLean’s work on IS Success to define IS Value and incorporate this dimension in the traditional view of project success. We propose a mechanism, based on concepts from the Lean Startup methodology, that can be layered on top of Scrum, to continuously measure both system-wide and feature-specific value and use this information to guide the development of the Information System.

As a demonstration for this proposal, we implement it in a real world scenario - the development of the SKAN Platform Information System, a system for knowledge sharing in the Agriculture, Food and Forestry sectors. This demonstration process is described here and used as empirical evidence for the evaluation of the proposal.
2. Problem

The most easily recognizable part of the problem lies with the high failure rates for IS Development projects. Despite increased demand for Information Systems, there is a consensus in the literature over the fact that failure rates for this kind of projects have remained consistently high over the years. A significant portion of these newly created systems ends up not being used at all or otherwise failing to deliver on expected value [2], [4], [5]. The issue is extremely relevant because Information Systems have become increasingly important in our society. In the United States, for example, by the 1980s, IT capital investment accounted for 32% of all capital invested. By 2009, the amount of capital invested solely in IT had reached 52% of the total invested [6]. More and more, organizations now see Information Systems as a core aspect of their businesses, essential not only in supporting operations, but also as part of their products and services offerings [1]. It is thus, important, to find ways that allow us to maximize the value derived from developing such systems.

The complexity of the problem is further increased by the difficulty in measuring the success of IS projects. What is success? To whom? Is it enough for a project to be completed under time, budget and scope constraints for it to be considered successful? Even if nobody uses the resulting system?

Success has multiple dimensions with different weights for each stakeholder. We can refer to project management success, technical success or business success [7]. IS success is a very important concept and yet a poorly defined one in many projects. It is possible, for instance, for a development team to consider a project successful while at the same time, from a business perspective, the resulting system to be found of little or no value.

Most IS projects employ the traditional definition of project management success [2], which relies on the project management triangle of time, cost and scope [8]. Most of the time, in fact, there is no explicit measure of the IS under development. The evaluation of the project success does not take its value into account. The methodology used to develop it does not have any measure of value to optimize for. This leads us to following problem statement: by relying on traditional project success criteria, the prevalent IS development methodologies do not help in guiding development efforts towards increasing the value created by the system.

3. Related Work

Most work related to this problem comes in the form of IS development methodologies or guiding principles for creating such systems. The main distinction we make between proposed solutions is in terms of more traditional approaches characterized by a heavy focus on planning (the Plan-driven approach) versus more flexible approaches such as the ones following Agile principles (the Agile approach).
3.1 The Plan-Driven approach

This is the type of solution characterized by a heavy focus on planning. This is the type in which structured approaches to ISs development, such as the SDLC family of methodologies, are included. Examples of such methodologies are the Waterfall, the V-Shaped, the Incremental Life Cycle or the Spiral models. These methodologies are characterized by clearly defined and distinct work phases such as planning, designing, building, testing, and delivering a system. The key concept in SDLC is that there is a well-defined process by which an IS is conceived, developed and implemented [9]. The Waterfall Model, one of the most well-known methodologies in this group, is probably not going away anytime soon [10]. In fact, plan-driven approaches may very well be suited for certain kinds of projects of which life-critical systems are an example [11]. Nevertheless, the limitations of plan driven approaches as the standard way to develop ISs have long been identified [12]. The SDLC and plan-driven approaches in general were recognized as inadequate for a broad set of problems and more flexible approaches were favored, which embraced change and focused on quicker delivery of value to the customer [13].

An interesting approach in the plan-driven group is Value Based Software Engineering, VBSE is interesting because it recognizes part of the problem we are considering here. Namely, it recognizes that in general, the development process is value-neutral – every requirement, use case or defect, is treated as equally important [14]. It goes on to assert that value considerations should be integrated in the IS development problem, which is a statement that mirrors our opinion. Despite the similar problem statement, however, we think this solution is still too reliant on heavy planning and not adequate for a broad class of problems, sharing the same limitations of the plan-driven family. The problems we are referring to here, are those with loosely defined requirements and for which the bulk of the work is, many times, in exploring the solution space, not in executing a plan.

Plan-driven methodologies are not adequate to solve the problem under consideration because they are not oriented towards the creation of value for the customer. They operate under the standard success criteria of time, budget and scope. They wrongly assume that achieving a plan implies project success and value creation [13] and in the last years, for many projects, they have been dismissed by practitioners in favor of more flexible approaches.

3.2 The Agile approach

In response to the limitations of plan-driven methodologies, the Agile movement emerged from the insight that “the opportunity for competitive advantage comes from being more agile than the competitors in one's market” [11]. This type of solution departs from the mindset dominating the Plan-Driven approaches. It does not negate the usefulness of some degree of planning and documentation, for instance, but it recognizes the limitations of these activities in solving the problems at hand. Priority is given to customer satisfaction and early and continuous delivery of value [13].
Agile approaches, such as the Scrum methodology, are considered an improvement over Plan-driven approaches because of the flexibility they provide – it becomes easier to make experiments, to explore the solution space and to change requirements during development in response to environment changes. Agile approaches, however, do not completely address our problem because they are not explicit in terms of success criteria, they do not define IS value and do not provide mechanisms to guide development efforts towards increasing it. Here is where we find room for improvement. We recognize the value in the Agile approach and propose a solution that builds on this work, addressing what we consider to be the weaker points from the point of view of the problem identified in our work.

4. Proposal

Briefly stated, the solution we propose can be described as an ISs development methodology that combines the Scrum methodology with the Lean Startup methodology and employs system use as measure of success for guiding the development process, thus increasing the value delivered by the system to its customers.

Our proposal is predicated upon mainly three topics that form the basis for its theoretical background: the Scrum Methodology, the Lean Startup Methodology and DeLone & McLean’s IS Success Model. Below, we highlight some key aspects of this proposal:

- It represents an IS development methodology based on Scrum and builds on top of it. Scrum Team, Events and Artifacts are kept and the development cycle is similar to Scrum’s Sprint;
- It employs D&M’s System Use as a measure of value (or key benefits) of the system being developed;
- It incorporates value, as defined above, as another dimension of an IS project’s success; this means we now have an additional criterion to assess the success of an IS project besides time, budget and scope. IS Value must be defined explicitly in the form of aspects of the system that translate into system use (e.g. the time spent using the system or the completion of specific actions inside the system);
- It adapts ideas from the Lean Startup methodology to build a new layer on top of Scrum. This new layer provides a mechanism to measure system value during development and use this information to guide the development efforts towards increasing the system’s value.

The proposal can be described in three parts:

- **Part 1 - Definition of Core Value Propositions** – A Value Proposition (VP) is traditionally defined as a statement of the value that a company, product or service offering provides to a customer [15]. We argue this is a useful concept when describing the main goals of a project. It can serve as the mission statement for the project and a quick way to explain its rationale. It also serves as a guideline for what kind of features should be included in the system being
developed. Only the features that contribute to the delivery of a value proposition should be developed. A few core VPs should be defined in the beginning of the project.

- **Part 2 - Definition of IS Value aspects** – IS Value is measured as System Use. System Use, in turn, can be defined in a number of ways, depending on the system being developed. The particular choice of aspects of system use should enable us to capture the usage of the system as a whole. The Core Value Propositions may also be helpful in choosing these aspects because they represent the high level goals of the system. Examples of aspects of system use include the number of users of the system, the amount of time they spend using the system or the amount of times they perform any specific action that is considered to be representative of system use.

- **Part 3 - The development cycle** – This is where the bulk of the development work occurs.
  - The project starts with a set of Ideas that represent the system’s Value Propositions to its customers. Those ideas are captured in the Product Backlog in the form of Value Propositions (VPs).
  - The fixed duration (2-4 weeks) sprint cycle starts with a Sprint Planning meeting. During this meeting, the team selects a certain amount of top priority VPs from the Product Backlog, limited by the effort available for each sprint, translates these VPs into MVPs and moves them to the Sprint Backlog. An MVP should be defined as a traditional user story in Scrum, with the addition of a list of MVP-specific metrics that should be measured. These metrics can be discussed among the Scrum team and are ultimately decided on by the Product Owner.
  - During the sprint, we build the selected MVPs together with the mechanisms required to capture the selected metrics for these MVPs (e.g.: a custom-built counter to log
clicks on a specific button or an off-the-shelf analytics solutions that can be reused for capturing other metrics to be selected in the future);

- At the end of a Sprint we have a Shippable Product Increment together with data that represents customer feedback on the MVPs under development;
- The Sprint Review meeting serves to discuss the previous sprint, including the Data from user feedback. These data will be used to Learn about our assumptions over the Value Propositions. It will be passed as input to the Sprint Planning, where we will decide on whether to further develop specific MVPs or simply to consider the VP complete and remove it from the PB.
- Back to the Sprint Planning, we now have Data that can help guide our development process.

5. Demonstration

The demonstration of this proposal consisted of implementing it in a real world scenario – the development of the SKAN Platform Information System, a platform for knowledge sharing in Agriculture, Food and Forestry sectors across Europe, Africa and Latin America. The project had multiple stakeholders and sponsors. Inovisa was the entity acting as the interface between them and this research team. Born in 2005 inside the School of Agriculture, University of Lisbon, Inovisa was founded with the goal of helping researchers and students in the creation of their own business projects. Its main purpose is to promote entrepreneurship and knowledge sharing in its core operating areas - Agriculture, Food and Forestry - with a strong focus on the Portuguese speaking countries.

Initial discussion included the project vision, goals, roadmap, and technological approaches. After considering different alternatives, the project sponsor decided to go with custom software development for the technological component of the information system and Ruby on Rails was the language and framework chosen for developing the software. The demonstration started in October 2014.

- **Part 1 - Definition of Core Value Propositions** – From the goals discussed in initial conversations, two Value Propositions emerged – VP1: SKAN Platform will provide a place where customers can discover and share news, events, and various other content related to Agriculture, Food and Forestry areas; VP2: SKAN Platform will provide the means for its customers to discover and communicate with their peers.

- **Part 2 - Definition of IS Value aspects** – As explained before, the aspects that define IS value can vary substantially depending on context. We chose four base metrics to characterize overall IS Value: **Active Users per Month, Webpages Visited per Month, Average Time on Page** and **New Registered Users per Month**.
Part 3 – Development work – We can look at the development work as a sequence of development tasks in six major feature domains of the system: Users, Posts, Events, Comments, Messaging and Notifications. These tasks were developed according to the process explained above and depicted in Figure X. A detailed analysis of selected tasks is provided in the full thesis document. Here we highlight the fact that we could observe development decisions being influenced by measurements of the features being developed. There were instances where some features lost priority because usage measurements showed little interest from the users. In other instances, for example, global IS Value measurements showed a low number of users on the platform, the team responded with marketing efforts, and improvements were observed in the global IS Value aspects. Using these definitions of System Use as a proxy for the value of specific features, we were able to influence the allocation of development efforts towards improving these metrics.

6. Evaluation

This proposal was evaluated through different methods that are detailed in the thesis full document. Here we focus on evaluation through our observations from the case study presented in Section 5 and through interviews carried out with members of the project team, other practitioners, and a member of the academia with professional experience in IS project management.

From the empirical results collected in the demonstration, we can say that Core Value Propositions provided a useful vision for the project. It helped us understand how value was being created for the customer and what features would be the most useful. In terms of IS Value aspects, it is debatable whether these aspects were the best choice but we think they were able to reflect System Use and convey a sense of the value being delivered by the IS. With respect to the development work, we found it extremely useful to build each feature together with mechanisms to provide continuous feedback on the value that it is delivering to customers. First, thinking about what will be measured helps in defining the feature itself because it forces us to think how it will provide value. Second, the information collected on each feature provided extremely useful feedback that enabled us to better...
understand the impact of these features on the system as a whole and based on these data, make
decisions about where to allocate development effort. Examples of ways in which this information was
used include the decision to allocate efforts on other areas instead of improving the search feature
because almost nobody was using this feature; the decision of allocating effort to marketing and
content creation because user activity was very low (and the ability to measure significant results of
this action); the understanding that a downvoting feature was almost useless without anonymity; the
impact of the user newsletter in user engagement.

A total of 8 interviews took place, between team members, practitioners and project sponsor. The
majority of the responses (7 in 8) show a high degree of validation for the basic premises of our
proposal, namely that value provided by an IS should be part of the criteria used for assessing its
success; and also that system use (of which website visits are an example) is a good proxy for
measuring IS Value. Team members agree that the methodology was useful and would strongly
consider using it again.

An interview with a member from the academia with professional experience in IS project
management also validated our fundamental premises. Provided that a specific project can be
developed in a way that is compatible with this proposal, she agrees that this is an interesting way to
tackle the problem that was presented, to increase the value delivered to customers, and to generate
important feedback for the organization.

7. Conclusion

What we have proposed here is a step further in exploring the Agile approach. We proposed a
methodology that is based on Scrum, uses concepts from the Lean Startup Methodology in order to
guide the development process, and employs D&M’s IS success model to evaluate both specific
features and the overall system being developed. Our goal was to prioritize development efforts based
on continuous feedback from users, reducing wasted effort and increasing the value delivered to customers.

There are future research avenues to explore. One of them is also very tied to Scrum research and is
related to how these methodologies work in scale – big projects, complex problems, large teams, deep
organizational hierarchy. Another area to explore is related to the possibility of defining goals for IS
Value, similar to what is done for cost, time and scope. Yet another, is how to store and share all the
System Use information collected during the development process, both for short-term action and
 collaboration between departments and also for long-term organizational learning.

We think our proposal is a useful approach to IS development projects, especially for those problems
some people label as wicked problems – problems for which planning is very difficult, the requirements
are extremely uncertain and there is a need and openness for an approach of solution-discovery and
experimenting with potential users of the system.
References


