Why the Integration of Change Management and Agile Software Development is Crucial in the Replacement of Complex IT Systems

A case study of the Dutch land registry system

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SUMMARY

This article shows the importance of a good integration of change management and software development when a complex IT systems needs to be replaced. A case study of the replacement of the Dutch land registry system is used in order to explain the crucial role of this integration and how this could be done. The most critical factor in a successful replacement is the involvement of dedicated and experienced employees. Their role in building a new system is crucial during the construction period, but a good integration of IT development and change management results in more benefits and for a longer period of time.

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1. Introduction

In October 2018 the Dutch land registry implemented a complete new registration system. It has been the most intensive IT operations of the Dutch Cadastre. The old system (called AKR) was a MSDOS based system, an end of life technology that needed to be replaced in order to stay flexible and adaptive to new developments in the environment of the Dutch land registry. As stated by the chief registrar of the Dutch Cadastre:

> *'The new Land Registry system is able to cope with the actual - and possible future - legal and societal demands as it introduced a system where elements, rights in rem, legal structures and other possible features can be added by implementing new business rules rather easily.'* (Roes & Vos, 2020)

In order to stay future-proof the Dutch Cadastre had to replace their current land registry system, a system that formed the foundation of the organisation for the last 30 years. Over the years, more and more applications were built and intertwined in this land registry system. The dependencies on this old (but reliable) system made it one of the most difficult IT changes in the history of the Dutch Cadastre.

However, replacing a system this size is not just an IT operation. One of the key factors for a successful replacement comes from within the organisation, it's people. The foundation of success is the knowledge of the people working with it. They know the ins and outs of the old system and therefore the most efficient way of land registry. This knowledge is a difficult to obtain. The employees need to know, see and feel the importance of replacing the old system, a system in which they trusted for the past 30 years.

Guiding the employees through this transition and involving them in creating the new land registry system are key factors to a successful implementation. Integrating both the IT software development and the business change process is a difficult task, however without this integration a successful replacement of a complex IT system becomes almost impossible. This article shows how to integrate the agile scrum method and the business change process in order

to deliver and implement a new complex IT system successfully. The replacement of the Dutch land registry system is used as a case study.

To succeed, it is important to involve employees and let them truly believe that their contribution and involvement is the key to success. That without them, a new system is impossible to create and implement successfully. This demands good leadership in change management, storytelling throughout the organisation and integrating the human side of change e and the technical side.

Within the Dutch Cadastre, the production department was responsible for guiding their employees through this transition. More than 350 employees of this department needed to adjust to this new land registry system. This means that they not only had to work with a new system, they also had to embrace it and see the value of it in order to contribute in the construction process and the further development in the near future.

This article shows the importance of integrating the human- and technical side of change when a fundamental IT program has to be replaced. This is done by using the renewal of the Dutch land registry system as a case study. First we describe some fundamental theories about change management, then the way in which the Dutch Cadastre guided their employees through this transition will be described. The results will show that change management and dedicated employees go hand by hand and are truly the key factor to success and with the conclusion some advises are described how to improve a next transition in any organisation.

2. Theoretical framework

The Dutch land registry system renewal was a process of change which involved the entire organisation. In order to be a success, the employees need to understand the reason for change and adapt to the changes that need to be done. Therefore a certain level of change management is necessary throughout the entire organisation. From top to bottom and the other way around.

Change management: Design vs. development approach

We are living in a time of changes. In order to stay future proof and to survive organisations must successfully manage large and complex changes. Change management therefore is a important factor. But what is change management? The definition of change management changed many times over de last two decades. In the early days it was stated that change management was:

> *'the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers'* (Moran and Brightman, 2001: 111).

The early literature describes change as an ever-present feature of organisational life and that organisations needs to identify where it needs to be in the future and how tot manage the changes required getting there (Burnes, 2004). Although both statements make sense and organisations do need to know where they want to be, it is the how of getting there that's the problem. Even when a top down organised project meets the requirements the project can still fail. The missing factor in this literature is the people that bring this changes to life in their daily work. It is actually the employees of the organization who have to change how they do their jobs and embrace this new way of working.

In the more recent literature, the change of the individual becomes more important in change management. Stated by an organization called Prosci (specialised in change management) and written in there e-book an introduction to change management:

> *'Change management is the discipline that guides how we prepare, equip and support individuals to successfully adopt change in order to drive organizational success and outcomes.'* (Prosci, 2020 p.1)

The focus in change management to guide individuals through a transition is more the focus on succeed in changing an organizations direction and implementing its strategy. In literature two mainstream approaches of change management are described. The first is the traditional design (or blue print) approach and the second is the development approach. The traditional design approaches is defined by the understanding that common employees do not have the skills and competences to take responsibilities within organizational change (Doorewaard en de Nijs, 1999).

The design approach is solution oriented starts with defining goals on a strategic level. The focus lays on organizational output and the transition. The process of change is one-off and ends when the new situation is implemented and a stable end state is reached. Another characteristic of the design approach is that participation of the employees in the design- and implementation phase is low because of the way its organized. The top of the organization initiates, coordinates and controls the changes and therefore consciously create a distance in the existing way of work, procedures and employees within the organization.

The development approach looks at organizational change the other way around. The organization and the people in it are a source of knowledge, experience and insight. When a change process has been initiated it has to use the quality within the organization in order to succeed. Employees will be involved in the problem analysis and on the way employees will be learning to shape the change. In contradiction to the design approach, the development approach has a more global planning. The transition of change is less defined and therefore has more flexibility. This gives the opportunity for adjustments in the process. The adjustments

made are therefore partly based on the knowledge and experience of the people in the organization.

There is no wright and wrong in these to approaches. Both can and should be complementary. When a organization uses the traditional blue print approach there will probably be a clear goal (or goals) and a good vision when a change program is initiated. The risk in this approach is that an organization is unable to change the mind of the employees and therefore becomes more difficult to succeed. Boonstra e.a. (2003) stated that:

'A classical top-down focused management style with inadequate top-down and bottum up communication is a risk and because of this changeprogramma's do not connect to the experiences of problems within the organisation' (Boonstra e.a., 2003).

The development approach on the other hand has a more bottom up strategy and involves employees in the changing process. When the employees are involved they get the chance to state their feelings, ideas and motives about the change. In this way resistance is no longer treated as a force that needs to be dealt with, but as a source of energy and knowledge that plays a constructive role in the change process (Doorewaard and de Nijs, 1999). The risk of the development approach is that organizational goals are changed or out of focus because a change process is merely a bottom up process. Employees who do not have the strategic goals of the organization in focus have the responsibility to choose.

Both approaches have important characteristics for bringing continuity to an organization. However, it's the balance between both which lays the foundation for success in a change program. From the design perspective a vision and clear goals will be formed. People do want to what is expected from them. The development approach makes sure that the experience, knowledge of people within the organization will be used.

In case of the Dutch Cadastre and the renewal of its land registry system it's about replacing a system and therefore integrating change management and software development. The land registry system is of a size that it touches almost every part of the organization and therefore has a lot of characteristics of organizational change management. Al the people within the organization need to know, feel and understand the why of the replacement. In the past the Dutch Cadastre used the traditional design (or in software development waterfall) method. Functional needs, requirements of the system and conditions were precisely specified. However, the projects were shut down before the they started on building the IT software. One of the biggest issues in these projects was that the plans needed change every time when new information came forward or when the described process needed adjustments. The adjustments most of the time were initiated by the employees working with the old system. In order to overcome this issue the Dutch Cadastre wanted to involve the employees in the change process and software development, but still wanted to keep the balance between bottom up development

and communication and overseeing the strategic goals of the project. Therefore, they switched from the traditional design approach to a more development orientated approach. This approach is known as the agile/scrum method and finds its origin within software development.

Agile philosophy vs. development approach

Agile is not a method but a philosophy which is founded in Utah by 17 well known software developers. They described this philosophy in the Agile manifesto (Beck et al., 2001). In essence, agile has a lot in common with the development approach within change management. Agile is an iterative approach to software delivery that builds software incrementally from the start of the project, instead of trying to deliver it all at once near the end (Rasmussen, 2018). The agile values are quoted by Beck et al. (2001):

'Individuals and interactions over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

Responding to change over following a plan'

This agile philosophy, like the development approach, prefers the input of individuals and interaction between people. In order to stay flexible during a software development project or change project it is important to describe the goals and plans globally. It stays important to keep the end goal (a new land registry system) in mind, but the way towards this end goal is more flexible and offers space for input, feedback and change during the project. Although, organizational strategy and the project strategy is still a important factor it needs to provide 'just enough' planning to launch executable initiatives early, focussing less on exhaustive long term planning and more on early execution in the form of action, planning, measuring and re-evaluating approaches as a matter of regular business rhythms (Parker Gates, 2018).

Agile Scrum method

Over the years, some different agile methods are designed and collected under the agile umbrella. Scrum, XP, Crystal methods, Feature driven development, Dynamic Systems Development Method, Test Driven Development and lean software development are the most well-known agile methods (Gandomani et al., 2013).

The Dutch Cadastre used the scrum method. Scrum is a agile project management framework that can be used for iterative and incremental projects of all types. In scrum, the development teams will deliver potentially shippable increments back to the business. Once the development team committed to what functionality they will be delivering in the next iterative period (called sprint) no additional functionality can be added. A product backlog is used to prioritize and organize the desired business demands and functionalities. In regards to the Dutch cadastre and the development of their new land registry system it's the business that prioritizes the components build by the developers.

Integrating the scrum method and change management strengthens change
Building a system so that it meets the requirements of the business is one step in replacing a system the size of the Dutch land registry system. It also demands organizational change because of the impact it has on the employees working with the system. On the day the new system will be implemented, employees need to understand the system and be used to the system. Therefore, it is important not only to use agile scrum in building the system, but also integrating the IT software development and the business employees while constructing a new system. For a successful renewal of the Dutch land registry system setting up a implementation program that integrates the scrum method for the software development with a way for the business employees to get used to the system is crucial.

So when an organization needs to replace its fundamental core system not only a new system has to be build. Maybe even more important is the way in which the organization makes sure that every part of the organization feels the need for change, knows the why for changing and getting their employees that need to work with the need system up to speed with the system while constructing it. Integrating IT software development and change management therefore is an important factor for success. The next chapter shows how the Dutch Cadastre integrated both and still kept working with the old system to accomplish the daily production.

3. Methodology

In order to construct and implement a new land registry system successfully the Dutch Cadastre integrated the technical side of change (building by using the scrum method) with the human side of change (change management). This chapter describes the way in which the Dutch Cadastre organised this integration. The focus will lay on the change management side and how the organisation prepared every employee for this transition and why it is so important that they are fully aware of the need for change. To oversee this process, two senior teamleaders were appointed as implementation managers. The task of the implementation managers was to guide the employees through this transition, to prepare them in using and understanding the new system, making sure employees understand the why of the system renewal and most important to organize the integration between this change management and the software development.

The way in which the technical software development was organised and why specifically the Agile scrum method is used is explained by Ter Reegen (2020) in his article …. From this point forward this article will focus on the human side of change.

The change management (implementation) program is described in four separated parts. The first is explaining the why of a new system, the second is the construction process of the new system, the third is the implementation phase and the fourth is the future development of the system.

Explaining the why of the Dutch land registry system renewal
From 2015 until 2018 the Dutch Cadastre developed a new land registry renewal system. This system has its impact throughout the entire organization. Therefore, it is important for every employee within the organization to understand why the change is happening and the

consequences for their own specific job. This demands storytelling throughout the entire organization, from the board of directors until the lowest management layer that connects to the working floor and therefore to the employees that need to understand the why. In the beginning employees thought that replacing the old system was just for improving the efficiency within the organisation and therefore look at the system renewal as a risk for their own job with resistance as a consequence. By telling the story why the organization needed to change the system people started to believing that it was also in their own benefit. The new land registry as earlier described is built because it is able to cope with the actual and possible future legal and societal demands as it introduced a system where elements, rights in rem, legal structures and other possible features can be added by implementing new business rules rather easily. The old system on the other was not future proof and therefore a risk for the continuity of the entire organisation. This story is told by the every layer of management within the organization and most of the employees started to understand the need for changing the system without looking at it like a risk for their jobs. Therefore, the implementation managers were able to use the knowledge and experience of these employees which played an important role in all the next three phases.

The construction process

The goal for the IT department during the construction process was to deliver a minimum viable product (MVP). The strategic choice for a MVP was made to keep a complex situation as easy as could be. By focussing on only that part, that is strictly necessary the success rate becomes higher. In order to achieve this goal, the IT department depended on the department of production to deliver dedicated employees to test newly built compartments, give feedback, think about improvements and therefore help to built and change the organisation bottom up. It is at this point that global strategic goals, change management and the agile scrum method comes to getter and complement each other. Therefore, it was crucial for the implementation managers to focus on the mindset of the employees. Some key factors in achieving this mindset were:

- Keep selling the employees the why of changing
- Integrate IT software testing and business experience and involvement in the system
- Form a group of employees from different disciplines to learn from each other's experience
- Train early adapters which on their turn can train their colleagues
- Use a testing environment
- Create time for shadowworking within the testing environment

While still selling the why to the entire organization the implementation managers needed to start organizing the way in which their change management ideas needed to integrate with the IT software development. As described, the agile scrum method used for building the system demanded that the business prioritise the functionalities to be build but also to test the delivered functionalities after the iterative sprint periods.

Testing newly built software functionalities results in benefits for both the IT software development and for the development approach within change management. The developers

get feedback directly from the end users of the system and the end users get to understand the system and more important have a say in the functionality of the new system. Therefore the resistance is low and the support for the new system grows.

In order to facilitate both the software development and the change program the implementation managers put together a specific group which contained members of different disciplines like product owners, processmanagers, early adapters (called super users) and the two implementation managers. Every teamleader of the production department appointed two super users from within their team. These super users were responsible for testing the newly built functionalities. Every time a new compartment was built by the developers, a team of employees would test this specific compartment for its workability and its usability. These test were done in a specially built testing environment which was needed to avoid any risks that might influenced the new land registry system. Within this testing environment the super users learned how to work with the new user interface of the system and how to register a deed in the right way. All the flaws, bugs and improvements that the super users found were redirected to the IT department so that they could make the necessary changes in the new registry system.

When the development of the new system went on, not only newly built parts had to be tested. Also, every employee that needed to work with the system had to be trained in working with the system. The super users were responsible for training these employees. During this period more than 350 employees of the production department needed to learn about and adapt this new registration system. The super users were facilitated in time to test and learn the system, so that they knew the latest built functionalities which they on their turn could explain forward to their colleagues within their team. As early adapters of the new registration system they played an important role in dispersing new information among their fellow team members.

While learning, the employees were also responsible for registering the current supply in the old system, because of legal agreements this all had to be done within the same amount of time as usual. However, because their influence the employees felt the responsibility in testing the new system. When testing and learning in the testing environment the employees were planned out of their regular work so that they could fully focus on learning and testing the new system.

With the evolvement of the new system employees needed to get more time to learn and adapt this system. The Dutch Cadastre called this shadowworking because the work they did, was next to the real work they did in the old environment. Coming closer to the delivery of the minimum viable product (MVP) of the system, the shadowworking time increased and the pressure on the employees within the production department increased with it.

In the end, a minimal viable product (MVP) was delivered by the IT department and the department of production trained their employees. Because of the consequences that could be when registering the wrong way, every employee needed to take and succeed a test in order to work with the new system. The shadowworking and the way in which the implementation managers formed the change program worked, every employee succeeded the test and were found capable to work with the new system when it has been implemented.

The implementation phase

During the construction period the implementation managers were already busy with planning the implementation of the new land registry system. Because of legal importance, this implementation can only be done with a big bang. This means that the moment the old system is switched off, the new system has to work. The stock that's in the old system needs to be fully processed when the system will be switched off, because it is impossible to do one part of the process of a legal bond registration in the old system and another part of the process in the new system. To get this done, the implementation managers needed to create a planning (in consultation with the planning department) which makes sure that the total stock is 0 and the process of every legal bond in the system is fully finished.

At this point, the workload for the employees in the department of production is at it's top. They need to learn the system, get the stock in the old system fully processed and be ready for the transition to the new system. Some hard choices for the employees were made in order to reach this goal:

- No leaf possible
- Longer working days (overtime)
- Extra working days
- Extra hiring of temporary employees
- Working the weekend of implementation

The choices above were guidelines, no obligations. The philosophy of the organisation was that employees who feel the responsibility are dedicated and will act responsible. So next to a good planning this transition demanded good leadership, communication and keeping the employees informed about the why of the transition, about the process of the transition and about the importance of a successful transition for the organisation.

Again change management plays an important role. The organization demands a lot of its employees, so without them and their dedication a transition this size can never be done successfully.

Closer to the moment of implementation, the planning agency showed all the employees an insightful overview of the amount of work that had to be done on that particular day. This to achieve an empty stock at the last day before the transition. The overview of the planning agency showed that the production department only could get the job done when a large group of employees came to work every Saturday from the 1st of September until the 12 of October (first day of the transition). For a lot of employees this meant a working week of 6 days over a longer period of time.

The last week before the transition the department of production achieved the goal of an empty stock. In this week they were also able to fully process every deed the same day as it came in. Because of this achievement and because of the fully trained employees the production department could give a go for the start of the transition.

During the transition, both the change management and the software development again complemented each other. At this moment highly intensified teamwork was required between the IT department and the department of production. Were the production department was responsible for getting the stock to 0 in the old system, IT was responsible for turning it off and bringing live the new system. When the new system was turned on the production department needed to test it by processing legal bonds in the new system.

This implementation was done in a weekend. Both the employees of the IT department and the department of production came to the same office were this process was executed. The previous testing period in witch both the employees of production and the IT employees worked together payed of. At this moment they knew each other and were able to find the right person in order to find the right answer.

The final implementation went as planned and was a success. On Monday the whole department of production was able to work in the new system and they were able to process all the legal bonds.

The future development

After the implementation of the MVP future development was needed in order to improve the efficiency, built nice to have functionalities and functionalities that are definitely necessary. This future development is an ongoing process in which the system will improve bit by bit. During this time, the way in which the system is built again plays an important role. The employees of the department of production keep testing newly built functionalities, give feedback and initiating possible improvements to the IT department.

With the MVP it was possible to fully process around 96% of the legal bonds. However not every bond was possible to process. In some cases, it was very difficult and employees with different disciplines needed to come together in other to make this possible. The Dutch Cadastre reacted on this by putting together a new operational team of employees, IT developers, processmanagers and one of the registrars. Together they invented a way of processing these bonds. In doing this they always gave priority to the legal certainty.

By making the strategic choice of delivering a MVP, the consequence that not 100% of the legal bonds were possible to process should be known. The Dutch Cadastre however, was not prepared for this and could only react on the problems at hand. Therefore the operational team that was put together, was not yet a flawless team with experience. Even so, there was no reserved budget for this team from the project. This aftercare should have been foreseen the moment that the choice for the MVP was made.

The next period, new functionalities were build and the work of the special team declined. After 3 months this team was disabled and the work could be done in the normal production teams. At this moment the Dutch land registry system still keeps improving every day. New

functionalities are built because of the integration of employees that work with the system and employees building the system. The change management together with the switch to an agile scrum development method still keeps paying off and were a key factor to a successful replacement of a complex IT system.

4. Results

In the beginning of the article we stated that change management together with an agile software development approach are key factors in successfully replacing a complex IT system. In order to show this a case study of the Dutch Cadastre is used. This case study showed that a good integration of a change management program complement each other and both together contributes to a successful replacement of a complex IT system.

A successful replacement of a complex IT system starts with explaining the why of the replacement. When the why is clear to the entire organisation employees know the importance of the replacement and understand what role they can play in building a new system. While playing a role in building they keep understanding what they are doing and where they are doing it for even seems that their work is not effective or repetitively. This also means that the management of the organization needs to keep explaining the why and keep explaining the perspective of what and why employees are doing.

Integration of change management and agile scrum development in complex IT system replacements are dependent of each other and when they are organized in a good way complement each other. Important in this is the way it is organized. Using early adapters, a testing environment, shadowworkers and iterative sprint periods are important factors in the integration. To involve and train all the employees, it is important to rotate the shadowworkers and increase their shadow working time when the moment of implementation comes closer.

Dedicated and motivated employees are crucial for a successful implementation. The moment the system needs to be replaced, an organization depends on the work, overtime and responsible feelings of their employees.

Next to the integration of change management and agile scrum software development it is important that an organization sets global strategic goals. The top of the organization needs to keep this goal in focus, in order to guide the system software building that is organized bottom up. Without good guidance the risk failing becomes higher.

5. Recommendations

The case of the replacement of the Dutch land registry system showed us that it is important to prepare an organization on the period after the delivery of an MVP. An MVP, as the names

says, is not a fully functional product and adjustments needs to be made after the implementation. Because of this, it is important that an organization needs to assemble a multidisciplinary group of employees so that they can deal directly with unexpected problems the moment a problem is discovered. In order to do this, this operational team needs to have mandate and trust from the top of the organization in solving this problems. The project on their turn, needs to reserve budget for the aftercare by this assembled group.

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