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Agile Development for Digital Government Services: Challenges and Success Factors

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Abstract Many governments have problems with developing digital government services in an effective and efficient manner. One proposed solution to improve governmental digital service development is for governments to utilize agile development methods. However, there is currently a lack of understanding on two important and related topics. First, whether or not agile development might help to overcome common failure reasons of digital government projects. Second, what the challenges and success factors of agile digital government service development are. This paper addresses both of these gaps. By gathering insights from six cases where agile methods were used in the development of new digital services, it identifies five core categories of challenges and success factors encountered when utilizing agile development methods for governmental digital service development: organizational, methodological, end-user-related, technological, and regulatory. Furthermore, based on these findings, it makes initial recommendations on when and how to best use agile methods for digital government service development.

Keywords: Agile development · digital government · public administration · e-government · failure · public services.

1 Introduction

As governments begin to become more “digital”, one important aspect is the digitalization of services. While governments are more than just service providers, this is a core part of a digital government. Yet, many digital government services are developed slowly and do not materialize as initially planned [16]. One potential reason for this is due to a disconnect between historically grown governmental approaches, processes, and regulations for non-digital services, and the more agile nature of new software development projects.

The private sector has innovated on their service development processes and many software companies now rely on some form of agile development methods for rapidly implementing services that are in line with user needs and expectations [4,11]. Such methods have the potential to bring out gains in effectiveness, efficiency, and user satisfaction. For this reason, governmental organizations are now beginning to experiment with integrating agile development methods into their own digital public service development toolkits [1,16,30].

However, governments are not businesses, governmental services are not private sector services, and citizens are not customers [15]. For these reasons, undifferentiated claims that agile methods or agile development will, normatively, improve governmental digital service development are flawed. There are substantial differences between the private sector and government. Governments face a unique set of challenges such as those related to risk aversion in the governmental mindset, resistance to change, and user (aka. citizen) demand for stability [15].

Thus, in order to investigate the role agile development may or may not play in the development of governmental digital services, there are at least two concrete areas that must be explored. First, what are common causes of digital government project failure and could these potentially be overcome by applying agile methods? Second, what challenges and success factors emerge when agile development methods are utilized for digital government service development?

In regard to the first question, a large amount of research has been done to identify common sources of digital government project failures [6,9,10,14,25]. Additionally, there is a large strand of literature on similar topics from other domains such as organizational management, management information systems, and computer science literature [8,13,26]. With regard to agile methods, there are some first studies that examine the use of agile methods in government organizations more broadly [18,32]. However, in regard to the second question, when it comes to exploring and conceptualizing which new challenges and success factors may arise when applying these methods in digital government service development, the literature is scant. Thus, it is against this background that the following research question emerged to guide this paper:

RQ: What are the commonly occurring challenges and success factors during the agile development of digital government services?

In order to answer this research question, a systematic review of six case studies selected via a theoretical sampling approach from the OECD's Observatory of Public Sector Innovation (OPSI) database was conducted. Each case represents a self-reported successfully developed digital government service where agile development was utilized in some aspect. By exploring these cases it is possible to begin to provide new insight into how agile development methods are applied inside digital government service development projects, and what challenges and success factors may emerge as a result. In answering this question, using such a method, the core contribution of this paper is related to its elucidation of the relationship between, and the empirical exploration of, the effects of agile methods during digital government service development.

2 Background

Inside the domain of digital government, sources of digital government project failure is a widely discussed topic (e.g., [6,10,14]). Although not all failure sources of digital government projects are necessarily transferable to service development, such research provides a strong foundation for initial exploration and

shows clear relationships to problems identified in traditional software development projects. On the topic of digital government project failure, researchers often distinguish between failure reasons and failure factors [2]. Failure reasons are related to particularities that lie within a project’s life-cycle, like a missing focus or execution issues, and hence might be tackled by applying new development methods. Failure factors, which exist in a project’s ecosystem—also beyond the project period—are unlikely to be effected by new development methods, and are therefore not relevant for the analysis within this paper. One of the clearest literature-based classifications of digital government project failure reasons comes from Anthopoulos et al. [2]. This classification consists of eight primary failure reasons: design-reality gaps, missing focus, content issues, skill issues, execution issues, regulatory issues, external factors, and missing user satisfaction.

In order to explore how agile development could, in theory, help to overcome the aforementioned challenges, it is valuable to start with a brief description and overview of agile development. Agile development methods involve creating, testing, and improving technology products incrementally [16]. Largely, all agile methods adhere to the tenets of the Agile Manifesto [3]. The Agile Manifesto was formulated by 17 thought leaders of agile software development in 2001 to lay down the four values and twelve guiding principles of agile methods [27].¹ Agile development is an umbrella term, with a number of different methodological approaches lying within it, such as Scrum, eXtreme Programming, Lean Software Development, and Feature-Driven Development [7,27]. Each method has its own strengths and weaknesses, yet most are similar in the importance they place on constant and continuous integration of users and their feedback, as well as small and iterative design delivery cycles.

Looking at the categorization of common reasons for digital government project failure by Anthopoulos et al. [2], it appears to be the case that many of these are challenges and inefficiencies similar to those within software development projects that were identified, and therefore targeted by, the pioneers of agile development. With this in mind, it is possible to map the values and principles associated with agile development against the respective failure reasons that they may help to overcome. This mapping is shown below in Table 1.

Table 1. Potential counteractive agile development values and principles mapped on common reasons for digital government project failure.

Failure Reasons	Design-reality gaps	Missing focus	Content issues	Skill issues	Execution issues	Regulatory issues	External factors	Missing user satisfaction
<i>Counter-active Values & Principles</i>	<i>V3, V4, P1, P2, P7, P9</i>	<i>V2, V3, P1, P3, P7, P9, P10</i>	<i>V3, V4, P2, P4, P10, P12</i>	<i>V1, P4, P5, P6, P11, P12</i>	<i>V2, V4, P2, P4, P8, P12</i>	<i>V4, P2, P4</i>	<i>V4, P2, P12</i>	<i>V2, V3, P1, P2, P3, P7, P9, P12</i>

Authors’ mapping based on [2,3].

¹ These principles and values can be found at: <https://agilemanifesto.org>.

3 Research Method

While, theoretically, agile development may help overcome common failure sources due to its respective values and principles, it is important to explore empirically the actual implementation of agile methods in digital government service development. In order to conduct such exploration, this paper utilizes a case-based methodological approach, where relevant cases were identified from the OPSI innovation database via a theoretical sampling approach [5,31]. The OPSI innovation database collects and maintains self-selected and self-submitted descriptions and reflections of innovation projects; these are the basis for the analysis in this paper. However, for this reason, there is a high amount of selectivity and survivorship bias in the data used. Nevertheless, due to the nature of this research, the cases are likely still of interest. One of the clearest reasons is that, though increasing, there is still a limited number of agile methods-based digital government service development projects. Thus, the OPSI database provides a critical resource for identifying developments of this nature. Furthermore, if this paper was studying how agile development helps to overcome governmental digital service development failure specifically, then this data would not be appropriate as it does not include failures. Yet, this is not the purpose of this paper. It only wishes to understand how, in successfully delivered digital government service development projects, agile methods did or did not aid in their success, and how agile influenced—and was influenced by—the context factors of these projects.

In this research, cases were selected using a six-step sampling process. For a case to be included, it needed to specifically mention “agile” within the case description, be at the highest governmental level (e.g., federal or national), and be related to a specific development of a digital government service. Based on these criteria it was possible to select 6 cases from the entirety of the database (421 cases at the time of writing). An overview of this process is shown below in Figure 1.

421	cases in <i>OECD Observatory of Public Sector Innovation</i> data base
75	cases mentioning keyword “agile”
57	cases on <i>National / Federal Government Level</i>
28	cases with focus on <i>Public Administration Modernization and Reform</i>
15	cases with tag <i>Digital and Technology Transformation</i> and/or tag <i>Public Service Delivery</i>
6	cases after final eligibility assessment

Fig. 1. Case selection process (authors’ visualization).

With the cases selected, the next step was to analyze each case description directly from the OPSI database. For this task, a qualitative methodological approach based on content analysis was selected [12,28]. Each description was read, and recurring themes and concepts were identified using an inductive coding strategy [29]. The coding was done independently by each of the authors of

this paper. After this was done, final codes were discussed and agreed upon via a collaborative process involving all authors.

4 Case Descriptions

(1) SmartStart. The SmartStart service is a life-event-based service aiming to improve access to information on services that are available for new parents dealing with the birth of a child in New Zealand. The service integrates information from a number of different agencies, and has increased the efficiency and effectiveness of government service provision within this domain. The challenges faced fell under the organizational, regulatory, methodological, and technological categories. For example, during the development of the service it was clear that there was different level of maturity, both technical and organizational, among the collaborative partners [22]. There were also issues related to procurement, technology interoperability, as well as misunderstandings about the agile method itself [22]. Success factors were related to the availability of funding for the development, cross-agency collaboration, a lean and agile-based approach, offering a minimum viable product (MVP), and engaging heavily with the end-user for continuous feedback [22].

(2) Blockchain of Frequencies. The blockchain of frequencies service was built in France and utilizes blockchain technology to ensure “the integrity, the immutability, the transparency, the traceability, the audibility of the reservations of frequencies” [23]. The development utilized agile software development methods, following a sprint-based approach for the creation of the service. In regard to core challenges, categorically these were mostly technological and methodological. The technology (blockchain) was complicated for the developers and the agile method required the organization to redesign and rethink certain organizational processes [23]. Similar to the first case, end-user feedback and interactions, as well as the continuous development and testing of an MVP were viewed as critical for the success of the development [23].

(3) Digital Mobile Key. The digital mobile key facilitates the identification and authentication of citizens for online service use in Portugal. This solution was also built using agile development, and, notably, relied heavily on a modular architecture, reusing components and standards, thus improving the overall agility and adaptivity of the service [19]. The challenges faced can be categorized into groups of end-user-related, technological, and organizational. For example, the service was organizationally and legislatively complex due to a large number of involved actors and influencing regulation, was subject to initially poor user uptake, and was technically dependent on a number of different components that required integration [19]. The relevant identified success factors were the importance of top-level managerial support, citizen interaction and end-user feedback, as well as the use of open standards [19].

(4) MyService. MyService was built by the Australian Government and aimed to provide an easier way for veterans to access services. The project brought together a number of different services, enabled data sharing among

said services, and improved the speed and ease at which a user could navigate through the services. In regards to agile development, the project was end-user-oriented, utilized human-centered design, and employed multidisciplinary and cross-organizational development teams [21]. The service faced challenges primarily related to organizational issues—such as low support and commitment of the implementation team and low levels of internal organizational capacity for digital service development—as well as regulatory issues, e.g., redefining and improving the service business processes [21]. Identified success factors were related to the importance of human-centred design, the use of multi-disciplinary teams, and focusing on development of internal agency capacities [21].

(5) GOV.UK step-by-step navigation. The step-by-step navigation service was built for the British government domain GOV.UK and aimed to improve the understandability of digital service journeys for citizens. The project was reliant on agile development methods, carried out by a multi-disciplinary and cross-governmental team, utilized human-centered design, and took end-user feedback into account throughout the entire duration of the development [24]. Challenges encountered were primarily technical, related to the actual usability of the service at its initial development stages [24]. Success factors identified during the development were having top-level managerial support and possessing the internal capacity to engage in cross-agency collaboration [24].

(6) GOV.UK Verify. GOV.UK Verify is a service that was created to provide a digital identity to British citizens allowing them to authenticate themselves on both public and private digital services. The service was delivered via a public private partnership managed by the Government Digital Service applying an agile and iterative process which built on multiple user research activities [20]. The challenges faced during the development can be categorized as end-user-related, organizational, and technological [20]. There were issues related to obtaining user adoption, changing organizational processes and business cases, complying with relevant legislative requirements and regulations, as well as service scalability [20]. Clearly identified success factors were related to multi-disciplinary teams and inter-agency cooperation, end-user engagement, and ensuring a transparent engagement approach across public and private sector stakeholders throughout the development process [20].

5 Results and Discussion

As a result of the analysis, it was possible to identify five categories that encompass the relevant challenges and success factors with regard to the use of agile methods in digital government service development, as well as the ways in which agile development seems to have helped foster perceived digital government service ‘successes’. These categories are: organizational, methodological, end-user-related, technological, and regulatory. The following subsections explore the identified challenges and success factors within these categories.

5.1 Identified Challenges

Organizational. The first group of challenges identified are organizational barriers. Primarily, these occurred due to missing or low levels of capacity within the specific organization. For example, in case 4, MyService, it was noted that “too often we look to outsource technological risks instead of owning them. We try to solve the easy problems, instead of taking on the difficult ones” [21]. Other organizational challenges were those related to structures within the organization as implementing agile development methods required structural changes, especially with respect to work and team processes. This can be seen clearly in case 1, where it was noted that when adopting an agile approach, “you’ll need to change how you’re organized for and lead work. Accept that there will be new roles and teams created within your organization and across the agencies involved” [17]. Further organizational issues were primarily related to project management and project complexity. Though agile development should focus on the use of small and multi-disciplinary teams, sometimes this still requires cross-agency collaboration, and such collaboration can be difficult if the appropriate experience is lacking, as was the case in cases 1, 2, and 4.

Methodological. The second group of challenges were those related to the actual methodology of agile development. These challenges occurred in cases 1, 2, and 4 the clearest, and were primarily related to organizations attempting to do agile development for the first time, thus having an incomplete or inaccurate understanding about the method. These misunderstandings were most often associated with when and how to integrate or gather user feedback (case 1 and 2), the actual agile development process (case 1), or how to build and make available an MVP (case 1 and 4).

End-user-related. The third categorization of identified challenges were those related to the end-user. These challenges were specific to the uptake and adoption of a created service. Interestingly, even though the studied cases used agile development methods, which, in theory, emphasize customer orientation and end-user involvement in order to counteract these sort of failures, some still suffered difficulties with respect to the adoption of the service. For example, in case 6, it was noted that one of the biggest challenges was being able to “engage with government departments and to convince them to adopt the service” and that it was “challenging to think of a customer-centric solution, rather than a department-centric solution” [20]. The fact that the studied services were built involving customer feedback throughout and still had issues with adoption raises interesting questions to be investigated in future research.

Technological. The fourth grouping of challenges were those related to technological challenges. In some of the cases, the solution being developed was fairly new, disruptive, or innovative, thus, there was missing knowledge about how to best build or implement certain technologies. This was identified in both cases 2 and 3 as a challenge. In case 2, it was noted that there was a need to “study it [the technology] well in order to grab all the implications, make sure that it was fitting our requirements” [23]. One of the most common issues with technology was related to interoperability. Many of the services were pointed for citizen use,

but were built with multi-disciplinary teams across different agencies. In order for such services to be delivered correctly, the technical systems of these agencies needed to be interoperable and integrated. As these systems had different technical specifications—also influenced by the regulatory challenges discussed in the next paragraph—such interoperability took time and effort, thus slowing down service development.

Regulatory. The final categorization of challenges identified in the cases were those related to regulations. Oftentimes, regulations are not in favor or amenable to agile development methods. In many cases, an unsupportive legislative environment was listed as a challenge that needed to be overcome. This obstructive environment could be, for example, issues with procurement (case 6). Agile development implies that projects are changeable and flexible, as the end result is not necessarily known. Yet, governmental processes, especially those related to procurement, rather require clear deliverables and goals as well as a clearly defined end-product; thus, there is a need for regulatory innovation or a change of procurement practices. Other regulatory challenges that needed to be overcome involved cross-agency collaboration and data sharing, or were specific to the domain of the service itself, for example related to GDPR or KYC regulations (see cases 3 and 6 respectively).

5.2 Identified Success Factors

Organizational. Starting with the organizational factors, for example, while lack of organizational capacity or inexperience with cross-agency collaboration was perceived as a challenge in some digital government service development, in the cases where this experience did exist, cross-agency collaboration was highlighted as a success factor. Additionally identified important success factors were the presence of funding, as well as strong organizational and managerial support for the service development. For example, in case 6, it was noted that “the key to this [the service] is getting the upfront investment right, both in terms of strong senior support and enough money to allow the idea and team to move quickly” [20].

Methodological. In regard to methodological success factors, a majority of the cases highlighted that the use of lean and agile development played a strong role in ensuring the success of their service development. One of the clearest examples of this comes from case 1, where a waterfall method was trialed, but failed, and an agile and lean approach was adopted instead [17]. Other success factors highlighted, and directly related to agile development methodologies, were the use of multi-disciplinary teams, focusing on human-centric design, the use of MVPs, and striving for transparency through the entire process. The analyzed cases, as a majority, found that services delivered using such methods were cheaper, more efficient, and more in line with user needs.

End-user-related. For the end-user category, the primary identified success factor was end-user engagement. In every case analyzed this was listed as a key and crucial part of ensuring the service was delivered properly. While some services still faced issues with regard to end-user adoption, by involving end-users

throughout the process of the design and development of the service, services were generally believed to better match citizens' needs, and thus lead to higher levels of satisfaction with the service.

Technological. Among the technological success factors, two in particular were identified: open standards and modular development. In case 3, for instance, it was highlighted that “the use of open standards also brings benefits, such as interoperability and data exchange, minimizes the risk of an application to become obsolete, and enables the solution’s reuse” [19]. In other words, integrating already existing standards and modules into new technological solutions not only speeds up the development, but also helps to potentially avoid legacy software issues, and further contributes to the development of technological and software ecosystems.

Regulatory. For the final group of success factors, regulatory, there were no clearly identified success factors mentioned in the cases. Regulation was only viewed as a challenge that needed to be overcome when delivering services in an agile manner. This raises the question of why this is the case, and should encourage research into how regulation and legislation must change so as to not hinder innovation or agile development of services, but instead encourage or foster such approaches.

5.3 Discussion

It turns out that there are a number of interesting challenges and success factors that one may encounter when applying agile methods to the development of digital government services. While there is an increasing amount of literature that puts agile development forward as a panacea for governmental digital service development issues, this study clearly shows that the use and implementation of agile development methods brings along its own set of issues and challenges that must be overcome and weighed against its potential benefits. In particular, it became apparent that while agile methods, by virtue of their values and principles, are a promising approach to overcoming failures related to design-reality gaps or missing user satisfaction and focus, challenges related to technological complexity or regulatory and skill issues remain, albeit with a different twist. Based on these results and the identified success factors that appeared to be associated with the use of agile development methods within the specific digital government services studied, it is possible to highlight some initial recommendations:

- If you are building a new digital government service that needs to be delivered quickly, and if it is unclear how it should best look or operate to meet citizen needs, it may be possible to experiment with or use an agile development approach.
- If an agile approach is to be used, it is important that there is strong managerial support, appropriate funding, and motivated team members with the proper experience supporting the service development.
- When working with multidisciplinary and cross-agency teams, it is important to ensure already at the beginning that there is a clear and shared

understanding about the development strategy, service goals, and operating procedures.

- If the service is being built in-house, it is of the utmost importance that there is the necessary technological and administrative capacity for service development. If this does not exist, it should be brought in either via hiring staff or drawing on experienced employees from other agencies.
- Expect challenges—agile does not always mean easier, but it certainly does mean different. While providing the opportunity to overcome some common failure sources, in some respects, it may even be harder than traditionally developed services and create new and unfamiliar challenges.
- Talk with the legal team. While lawyers are often thought of being the antithesis of agility, agilely developed services may face regulatory resistance and uncertainty; having legal support to overcome and manage such issues is thus necessary.
- Don't be afraid to be wrong. Agile methods and service development works best when initial MVPs are released and feedback is gathered repetitively over the development duration. The goal is not to end up with exactly what was planned at the beginning, but to deliver a functioning service in line with user expectations and needs.

6 Conclusion

This paper analyzed the potential of agile methods for digital government service development and compiled the respective challenges and success factors. It was possible to map potentially counteractive values and principles of agile development to commonly occurring digital government project failure reasons stated in the literature. As, following this analysis, agile development appeared to offer some opportunities for digital government service development, the next step of the research was to understand and untangle the potential challenges and success factors one may expect when implementing agile within digital government service development. In order to gain such knowledge, the paper utilized a theoretical sampling methodology to select six successful digital government service development projects where agile was utilized to elucidate five commonly occurring themes using a qualitative content analysis approach.

As a result of this research, there are three concrete contributions to the literature made in this paper. First, mapping the agile development principles and values to commonly occurring sources of digital government project failures and shortcomings. This mapping should set the stage for future research that explores empirically whether or not following such principles and values can—in practice—overcome, prevent, or preempt failure when developing governmental digital services. Second, the paper identified five categories of challenges and success factors that one may experience if utilizing agile methods for digital government service development. Therefore, this research is likely to be useful to any organization interested in understanding what to expect if it decides to adopt agile development approaches. Finally, based on the findings, the paper was able

to make concrete recommendations for those who may wish to experiment with agile methods for their own digital government service development.

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