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# Innovating and optimizing in public organizations: does more become less?

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## ABSTRACT

To enhance public service performance (PSP), public organizations are challenged to optimize and innovate their processes, techniques, policies and services. But can public organizations go too far when innovating and optimizing? Based on survey data from Dutch water authorities, we show that optimization initially contributes more to PSP than innovation, but its contribution is curvilinear: the impact of optimization becomes smaller the more optimization is conducted. The relation between innovation and PSP is, however, linear. Based on additional qualitative data, we show that ambidextrous water authorities run less risk of over-optimizing and use integrative strategies to deal with innovation-optimization tensions.

**KEYWORDS** Innovation; optimization; public service performance; non-linearity; mixed-method

## Introduction

The public sector is urged to innovate to enhance public service performance (PSP) and at the same time to continuously optimize current operations in order to enhance efficiency (e.g. Osborne and Brown 2011; Hartley, Sørensen, and Torfing 2013). In the last decades, the effort from public service organizations (PSOs) to improve quality, efficiency and effectiveness of public services has been influenced strongly by New Public Management (NPM) principles of economic rationalization and business-like thinking. PSOs have imported many business-like concepts, practices and instruments such as performance and strategic management, quality management, more managerial autonomy, a more entrepreneurial and innovative culture, and enhanced ‘customer’ orientation (George and Desmidt 2014; Pollitt and Dan 2013; Pollitt and Bouckaert 2017). There is indeed evidence that management reforms and performance management practices – on average – contribute to PSP (e.g. Walker, Damanpour, and Devece 2010a; Gerrish 2016), although critiques on these reforms and practices remain potent. However, an incessant focus on efficiency and performance measurement can also result in efforts to optimize processes to achieve short-term performance targets efficiently, but introduce barriers to innovation, with an inherent risk for the organization’s long-term results (e.g. Hartley, Sørensen, and Torfing 2013; De Bruijn 2002). Scholars argue that PSOs thus face

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a trade-off between achieving short-term performance goals such as efficiency and effectiveness, and long-term or strategic goals centred more on societal outcomes (Verbeeten 2008).

In this article, we enhance our understanding of the improvement of PSP by studying the contribution of discontinuous innovation and of continuous incremental improvement to PSP, and also address the tension between the two. We introduce the term ‘optimization’ for continuous incremental improvement (Gieske, Van Meerkerk, and Van Buuren 2018) to avoid confusion related to the term ‘improvement’ and its conflation with innovation (Osborne and Brown 2011). Moreover, it is also important to emphasize that optimization in our paper should not be conflated with a sole focus on efficiency, i.e. the constant reproduction of the existing against lower costs or in a shorter time (Behn and Kant 1999), – rather, optimization implies a continuous focus on improving existing services, policies, process and techniques.

The ability to pursue innovation and, at the same time, optimize existing processes, products or services is referred to as ambidextrous capacity (Duncan 1976; Tushman and O’Reilly 1996; Smith and Umans 2015). Organizational ambidexterity is important because even though innovation and optimization compete for resources in the short term, they are both necessary (and mutually reinforcing) to enable long-term success (He and Wong 2004; Smith and Lewis 2011). Organizational ambidexterity of private organizations has been studied extensively (e.g. March 1991; Gibson and Birkinshaw 2004; Junni et al. 2013). Studies in the public sector have more recently begun to emerge (e.g. Choi and Chandler 2015; Smith and Umans 2015; Cannaerts, Segers, and Henderickx 2016; Gieske, Van Buuren, and Bekkers 2016; Boukamel and Emery 2017).

However, ambidexterity is difficult to achieve. Organizations that are good in either innovating or optimizing run the risk of over-innovating or over-optimizing, which can undermine their performance. If they engage too hastily in innovation at the expense of optimization they may suffer the costs of experimentation and take too many risks without gaining many benefits (March 1991). This can trap an organization in an endless cycle of failure and unrewarding change, the so-called failure trap (Levinthal and March 1993; Gupta, Smith, and Shalley 2006; Choi and Chandler 2015) or innovation trap. Over-optimizing organizations stick too long to an optimization strategy where innovation is needed, because of its short-term success and limited risk (March 1991; Levinthal and March 1993; Choi and Chandler 2015; Sirén, Kohtamäki, and Kuckertz 2012; Uotila et al. 2009). The risk of this so-called success trap (Levinthal and March 1993; Gupta, Smith, and Shalley 2006) or optimization trap is that organizations may be content to stay on an inferior path and ignore a more promising path (Choi and Chandler 2015). Thus, although optimization activities may initially enhance performance, continuously and consistently optimizing might, in the longer run, diminish it (Uotila et al. 2009).

Innovation and optimization traps are indications of the so-called ‘too much of a good thing effect’ (TMGT) (Pierce and Aguinis 2013). As Pierce and Aguinis (2013) point out, the TMGT effect occurs when management practices are taken too far and their initial contribution to performance diminishes the more these practices are used and, eventually, a negative performance impact can even emerge. Relations of this kind typically are curvilinear and follow an inverted U-shape. Škerlavaj et al. (2017), for example, find a curvilinear relation between idea generation and implementation; too many novel and creative ideas lead to fewer ideas actually being implemented.

Quantitative research on the relation between innovation, optimization and PSP is still relatively scarce (De Vries, Bekkers, and Tummers 2015; Gieske, Van Meerkerk, and Van Buuren 2018). This holds in particular for possible non-linear relationships (Walker, Berry, and Avellaneda 2015). This is an important gap as strong pressures on PSOs to enhance efficiency and accountability, and an extensive use of performance measurement systems with their inherent pitfalls of focussing on short-term goals and quantifiable results (Verbeeten 2008), may have resulted in a bias towards optimization (De Bruijn 2002; Hartley, Sørensen, and Torfing 2013). It thus seems quite likely that PSOs risk over-optimizing, whereby more optimization no longer contributes significantly to PSP, and innovation might be a more beneficial strategy. Although over-innovation in PSOs may seem less likely, innovation has long been hailed as the panacea to many maladies of PSOs (Osborne and Brown 2011), and many organizational and management innovations have been introduced under NPM and post-NPM reforms (Hartley 2005; Hartley, Sørensen, and Torfing 2013). Some of the mixed outcomes of these innovations may be attributed to a too hastily and frequent introduction (Choi and Chandler 2015). For instance, Wynen, Verhoest, and Kleizen (2017) find that PSOs with a more turbulent history of reforms are less likely to develop an innovation-oriented culture. Furthermore, evidence of an inverted U-shape relationship between innovation activities and (financial) performance has been reported in private sector literature (e.g. Uotila et al. 2009).

This article contributes to public management research by examining the potentially non-linear relationships between optimization, innovation and PSP, and the tensions between the two, using a mixed-method design. We study these relationships in Dutch regional water authorities (RWAs), which are functional democracies responsible for regional water management, flood protection and sewage treatment in The Netherlands. The Dutch governance context of a decentralized structure with strong local and regional governments, corporatist tradition and civic society is potentially favourable for public innovation (Bekkers, Tummers, and Voorberg 2013). At the same time, NPM-like measures have been implemented extensively in Dutch PSOs over the last three decades, including planning and control, service management, competence management, quality management and performance management (Ter Bogt 2008; Verbeeten 2008; Speklé and Verbeeten 2014). The RWAs in our sample are professional organizations with clear goals and well-defined tasks and are fully financed by the taxes they levy themselves. Their performance is benchmarked yearly. The transparent relation between tasks and taxes allows for well-specified performance measurement but may also lure them into the pitfall of focussing too much on optimization. The RWAs have undergone few structural reforms, besides a long history of merging; their number reduced from 125 in 1990 to 21 in 2018. In recent years, they increasingly embrace New Public Governance approaches (Osborne 2006), connecting their goals with those of other governments and stakeholders, with whom they build long-term and trustful relations (e.g. Edelenbos and van Meerkerk 2015). They have been strongly urged to innovate more (Unie van Waterschappen. 2011). They thus provide a good empirical setting to study how PSOs deal with the pressure to both optimize and innovate. In line with the TMGT effect stipulated by Pierce and Aguinis (2013), we expect that, initially, innovation and optimization contribute to PSP. However, this contribution may start to diminish when too much innovation and optimization takes place. By using a mixed method design we (a) quantitatively test these relationships and (b)

qualitatively go deeper into the mechanisms behind potential over-optimization or over-innovation. We will test statistically – based on survey data – whether the relationships between optimizing, innovating and PSP are curvilinear, and thus indicate whether optimization and innovation have diminishing returns for PSP. We are interested in ‘total’ or ‘overall’ innovation and optimization – including policies, services, processes and techniques –, and their impact on overall PSP, rather than in the impact of specific types of innovation or optimization carried out at one point in time (Yang and Pandey 2007; Walker, Damanpour, and Devece 2010a; Walker, Berry, and Avellaneda 2015; Damanpour, Walker, and Avellaneda 2009). In the qualitative part of the analysis we conducted focus groups to examine practices that may cause a bias towards optimization or innovation and thus pose a risk of getting trapped in too much optimization or innovation.

This article is structured as follows: We will first review public and private sector literature describing adverse effects of too much innovating and optimizing activities on performance and formulate hypotheses on curvilinearity. Next, we will describe our mixed-methods approach and results. Finally, we will discuss the potential drivers that underlay these results, and describe the implications for public management theory, research and practice.

## **Theoretical background**

Public service performance can be conceptualized as achieving public goals in an effective and efficient manner, preserving present and future quality of public services as well as legitimacy among stakeholders (Verbeeten 2008). It thus is a multidimensional construct (Andrews et al. 2010; Walker, Boyne, and Brewer 2010b), often measured in terms of efficiency, effectiveness, quality, future proofing, responsiveness and legitimacy towards stakeholders (Boyne 2002, 2003; Yang and Pandey 2007).

Innovation and optimization are both essential for enhancing performance (March 1991; Damanpour, Walker, and Avellaneda 2009; Junni et al. 2013; Uotila et al. 2009; Osborne and Brown 2011; Gieske, Van Meerkerk, and Van Buuren 2018). Innovation is generally defined as the implementation of a new – technical, organizational, policy, service or other – concept that changes and improves the functioning and outcomes of the public sector (Hartley 2005; Walker 2007; Damanpour, Walker, and Avellaneda 2009). This concept is perceived as new by an individual or other unit of adoption (Rogers 2003). Innovation is associated with explorative activities, discontinuous renewal of processes, techniques and services, breaking with current mindsets, generating new knowledge and learning new competences, flexibility and experimentation, risk-taking and the possibility of failure (March 1991; Hartley, Sørensen, and Torfing 2013; Choi and Chandler 2015). Optimization can be defined as a gradual improvement of current policies, processes, techniques, and services, in continuity with the past (Osborne and Brown 2011; Moore 2005). Optimization is associated with exploitative activities, incremental improvement, refining current practices, exploiting existing knowledge and competences, within current mindsets (March 1991; Jansen, Van Den Bosch, and Volberda 2006; Hartley, Sørensen, and Torfing 2013; Choi and Chandler 2015).

Organizations may have a preference for either innovating or optimizing, which – following the Miles and Snow (1978) model – can also be labelled as a more ‘prospecting’ (i.e. innovation) or a more ‘defending’ (i.e. optimization) strategy, or

not develop a coherent strategy at all and mainly take a 'reactive' stance (Boyne and Walker 2004; Andrews et al. 2009). However, the Miles and Snow typology includes another strategic approach, that of 'analysers' that balance prospective as well as defensive elements, and create structures and processes that both allow innovation as well as optimization (Miles et al. 1978). These analysers, which are equally dextrous in continuously optimizing current processes, products and services and developing and implementing new ones, are also generally referred to as ambidextrous organizations (Duncan 1976; Tushman and O'Reilly 1996; Bryson, Boal, and Rainey 2008; Smith and Umans 2015).

However, ambidexterity is hard to achieve, as patterns of learning associated with innovation and optimization tend to be self-reinforcing, often to the exclusion of one another (Bedford, Bisbe, and Sweeney 2018). In private sector literature, approaches to deal with the tension between innovation and optimization are well studied. Dual approaches aim at separating the two in time or space, whereas trade-off approaches treat this tension as a dilemma and advocate finding an optimal compromise or balance (Smith and Lewis 2011; Löfstål and Jontoft 2017). In addition, dialectic approaches seek to identify synergies and integration. Paradoxical 'both-and' approaches assume that tensions persist and are beneficial, and aim at dealing with competing for interrelated demands simultaneously, accepting as well as resolving the tensions (Smith and Lewis 2011; Löfstål and Jontoft 2017), and are widely advocated (e.g. Gibson and Birkinshaw 2004; Andriopoulos and Lewis 2009). Private sector research has provided evidence of positive performance impacts of ambidexterity (Gibson and Birkinshaw 2004; He and Wong 2004; Jansen, Van Den Bosch, and Volberda 2006). However, relations between innovation, optimization and performance are complex and contingent upon factors such as environmental dynamism (Jansen, Van Den Bosch, and Volberda 2006). Moreover, they are mediated by organizational factors such as strategic learning (Sirén, Kohtamäki, and Kuckertz 2012), and may be curvilinear (Uotila et al. 2009). Below we will formulate hypotheses on the nature of the optimization and innovation relationships with PSP. As there is not much quantitative research on these relationships in public sector research we will partly build on insights on these relationships in private organizations.

PSOs have imported a range of performance management techniques and instruments to enhance efficiency and quality of processes and services, and transparency of outcomes, including rational planning, target setting and budgetary control, lean management, and performance measurement (Arnaboldi, Lapsley, and Steccolini 2015; George et al. 2017). In a meta-analysis of the impact of performance management, Gerrish (2016) finds a (small) positive impact on PSP for a wide range of policy fields. Nevertheless, longitudinal studies are almost absent and the effectiveness of imported business-like management systems is contested (e.g. Radnor and Osborne 2013). Several authors have warned for the potentially negative impact on innovation (Arnaboldi, Lapsley, and Steccolini 2015; De Bruijn 2002; Hartley, Sørensen, and Torfing 2013). As stated above, short-term benefits of optimization strategies, emphasizing short-term results and efficiency of work processes, may lead to over-optimization and prioritizing efficiency over effectiveness of public services, hampering long-term performance (e.g. Hartley, Sørensen, and Torfing 2013). Adverse effects of 'too much' results-based management were found by Yang and Pandey (2007), who show for American state health and human service agencies that results-based management changes, including strategic management, customer orientation,

quality improvement and benchmarking, initially have a positive relationship with public responsiveness, but that this relationship has an inverted U-shape, i.e. with diminishing returns and eventually even having a negative impact. Furthermore, Andrews and Boyne (2011) find for English local authorities that the impact of their corporate capacity, i.e. the administrative capacity to manage financial and human resources, on PSP follows an inverted U-shaped pattern: the initially positive impact becomes weaker and, eventually, turns negative around the mean for effectiveness and cost-effectiveness. Andrews, Boyne, and Mostafa (2017) find that administrative intensity has an inverted U-shaped relationship with PSP in UK universities, with a tipping point of one standard deviation above the mean. Private sector research indicates that large companies also run the risk of overemphasizing optimization. For instance, Uotila et al. (2009) show that large companies over-engage in optimization and that approximately 80% of the 279 firms in their sample engage in suboptimal levels of innovation.

Taking stock of the theoretical and empirical insights on potential optimization traps we conclude that these traps do occur in public as well as private organizations. We thus hypothesize:

**H1:** The association between optimization and PSP is curvilinear – implying that the positive impact of optimization on PSP diminishes the more optimization is conducted.

Scholars and practitioners (e.g. Alburry 2005; Hartley, Sørensen, and Torfing 2013; Torfing and Triantafyllou 2016) as well as national governments and international institutions like the EU and OECD (Bason 2018; Arundel, Casali, and Hollanders 2015) underscore the need, urgency and benefits of innovation to enhance PSP. Innovation is often portrayed as inherently good (Osborne and Brown 2011), something PSOs and public servants ought to do, thereby constituting a moral ‘imperative’ to innovate (Jordan 2014). Several quantitative studies on the relation between innovation and PSP provide evidence for innovation’s positive impact. For instance, Damanpour, Walker, and Avellaneda (2009) find a positive relation between a combination of innovation types (service, technological and administrative) and PSP of local governments (see also Naranjo-Gil 2009). Walker, Damanpour, and Devece (2010a) find a positive relation between management innovation and PSP, with a mediating effect from performance management. However, the extensive positive overtones, pressures by higher tiers of government, and desire to stand out as ‘innovative’ PSO may draw necessary resources away from other government services (Jordan 2014), lead to rhetoric reframing of improvements as ‘innovations’ (Osborne and Brown 2011), and disregard the costs of failure (Choi and Chandler 2015). Although Choi and Chandler (2015) qualitatively discuss innovations traps in PSOs, quantitative studies that report negative results of innovations are extremely rare, and mainly report on the negative impact of too frequently or too hastily introduced structural reforms on innovativeness (Wynen, Verhoest, and Kleizen 2017). For quantitative evidence of a potential innovation trap, i.e. non-linear relations between innovation and performance, we thus turn to private sector literature. Uotila et al. (2009) find an inverted U-shaped relationship between innovation and financial performance of 279 firms in a longitudinal analysis over a 14-year time

period, analysing the relative share of reported innovation versus optimization activities. Similar results are found for SMEs (Kim and Huh 2015; Kreiser et al. 2013).

Quantitative research on innovation in private sector organizations thus points to a potential negative impact of ‘too much’ innovation on performance. For the public sector we found no quantitative study indicating such an impact. However, given the findings that innovation does contribute to PSP, but that the high expectations concerning the impact of innovation on the functioning and outcome of PSOs are often accompanied by a strong and moral appeal to innovate and induce risks of over-innovation, we hypothesize:

**H2:** The association between innovation and PSP is curvilinear – implying that the positive impact of innovation on PSP diminishes the more innovation is conducted.

## Methods

We have applied a mixed-method approach to answer our research question. We followed a two-step approach. Firstly, we conducted a survey among 667 respondents in 22 RWAs in the Netherlands, measuring innovation, optimization and PSP, based on the perceptions of organizational staff. We used staff perceptions as secondary data on the water authorities do not provide information concerning optimizing and innovating. Performance is expressed as compliance against policy norms of higher tiers of government, which is a rather technical and unidimensional measurement of PSP, and also shows little variation between RWAs (Unie van Waterschappen. 2018; Tillema 2007). Measuring individual perceptions thus allows for a broader assessment of our constructs, e.g. by including items on legitimacy, alignment with stakeholders and future-proofing in the performance scale. We analysed the quantitative data and investigated possible curvilinear relationships using OLS regression analysis in Stata. In the next step, we discussed actual innovation and optimization practices in focus groups in 10 RWAs, within total approximately 120 participants, and evaluated the qualitative data to find information that may indicate innovation or optimization traps, and help understand underlying causes. As such, we applied a sequential explanatory mixed method design where we first sought to identify broader relationships using quantitative data and then more strongly contextualize these relationships using qualitative data (Creswell 2014).

### *Phase 1 quantitative analysis*

#### *Data collection*

We collected data in February 2016 through an e-mail survey among the staff of the 22 RWAs involved in primary tasks in the fields of regional water management and sewage treatment. The survey was distributed by the top management to organizational units responsible for activities within the primary task fields, i.e. flood risk management, surface water quality and quantity management, and wastewater treatment; activities include policy and planning, regulation and enforcement, and construction and maintenance. Supportive services, such as administrative or financial units were not included. In total 667 surveys were completed. The overall response



rate is 33%. Respondents were asked to indicate whether they were a manager (18%), process- or project leader (34%), process- or project employee (44%), or 'other' (4%). Furthermore they were asked to indicate their task field: flood protection (15%), water quantity management (27%), water quality management (11%), sewage treatment (22%), or overarching (25%). Eighteen per cent of the respondents were female. The average age was 47.

### Measures

We built on existing scales that we adapted to the context of Dutch water authorities and the phrasing commonly understood in this context (see Table 1). In line with earlier research, we used comprehensive scales that aggregate different constituting elements of our constructs to measure innovation (5 items), optimization (4 items) and PSP (6 items) (Yang and Pandey 2007; Walker, Damanpour, and Devece 2010a; Walker, Berry, and Avellaneda 2015; Damanpour, Walker, and Avellaneda 2009). See Table 1 for the items as well as reliability and validity measures. All items were measured using a 7-point Likert scale ranging from totally disagree to totally agree.

### Reliability and validity

Convergent and discriminant validity of the measurement scales were examined, based on confirmatory factor analysis. Factor loadings were larger than 0.60, above the conservative cut-off level of 0.5 (Hair et al. 1995), which demonstrates convergent validity (Table 1). Furthermore, the composite reliability indexes of the constructs were above 0.80, exceeding the 0.60 threshold (Fornell and Larcker 1981). Average Variance Extracted (AVE) was above 0.50, further demonstrating convergent validity. Corrected item-to-total correlations were greater than the general threshold of 0.40 (Field 2005). Cronbach's alphas were above 0.8, exceeding the widely accepted cut-off value of 0.70. The AVE of the constructs were larger than the corresponding squared inter-construct correlations (SIC), revealing the distinctiveness of each construct and thus discriminant validity. Finally, we calculated the Heterotrait-Monotrait ratio

**Table 1.** Measurement scales for innovating, optimizing and public service performance, including factor loadings and reliability coefficients.

Measurement scales
<p><b>Innovating</b> (adapted from: Jansen et al. 2006; Popadiuk 2012; Prieto and Pérez Santana 2012) To improve performance for my work field my organization has during the last five years: Implemented really new policies (0.7); implemented really new technology (0.704); offered really new services (0.667); implemented really new processes (0.659); experimented with really new policies or techniques (0.748) (AVE=0.606, CR=0.824, Cronbach's alpha 0.825)</p>
<p><b>Optimizing</b> (adapted from Jansen et al. 2006, and aligned with scale for innovating) To improve performance for my work field my organization has during the last five years: Improved existing policies (0.767); improved existing techniques (0.755); improved existing services (0.821); improved existing processes (0.746) (AVE=0.597, CR=0.856, Cronbach's alpha 0.848)</p>
<p><b>Public service performance</b> (adapted from Gibson and Birkinshaw 2004; Prieto and Pérez Santana 2012; Klijn, Edelenbos, and Steijn et al. 2010; Bontis, Crossan, and Hulland 2002) My organization has improved performance over the last five years for my work field on: efficiency (same results against lower costs or faster) (0.742); quality (we deliver more quality against similar costs and time) (0.781); effectiveness (we reach our goals better) (0.741); collaboration (we reach our goals better combining those with the goals of others) (0.709); legitimacy (stakeholders are satisfied with the water authority) (0.602); future proofing (we can face the future with trust, expected future developments are included in policies and plans) (0.669) (AVE=0.504, CR=0.858, Cronbach's alpha 0.856)</p>

(HTMT) of correlations, which has been argued to be a more robust method to assess discriminant validity and requires looking at the average of the heterotrait-heteromethod correlations (i.e. correlations of items across all variables) relative to the average of the monotrait-heteromethod correlations (i.e. correlations of items within the same variables) (Henseler, Ringle, and Sarstedt 2015). All HTMT ratios were below the proposed cut-off of 0.90 (Teo, Srivastava, and Jiang 2008), with values of .88 (innovation), 0.72 (optimization) and 0.85 (PSP) respectively.

### *Common source bias*

There are two important reasons why common source bias is not of concern to our analysis. First, in this study, we hypothesize and test non-linear relationships between innovation, optimization and PSP. Finding significant non-linear relationships cannot be the result of common source bias – as was demonstrated by Siemsen, Roth, and Oliveira (2010). Indeed, if anything such bias would work against our hypotheses, not for them. Second, we complement our survey data with qualitative data. This allows us to cross-validate the reliability of the uncovered statistical results while simultaneously providing further clarification and deepening of the findings (George and Pandey 2017).

### *Descriptive statistics and correlations*

Descriptives and correlations between variables are reported in Table 2. There is a strong correlation between perceived levels of optimization and innovation. The relationship is a bit stronger compared to private sector findings (e.g. Gibson and Birkinshaw 2004; Cao, Gedajlovic, and Zhang 2009). The mean for optimization is higher than that for innovation, indicating that respondents agree more with the statements that their RWA has engaged in optimizing activities in the last five years.

### *Statistical analysis*

In order to test H1 and H2, we employ OLS regression analysis using Stata. First, we construct a linear model where PSP is the dependent variable and innovating, optimizing as well as the controls are the independent variables. Second, we construct a non-linear model by adding the squared terms of innovating and optimizing. Such an approach is typically used to assess non-linear relationships (see, for instance, Andrews and Boyne 2011). Before constructing the model we need to make sure that we adhere to the assumptions of OLS regression modelling (Lee, Benoit-Bryan, and Johnson 2012). Our respondents are clustered in different organizations and are thus not independent – we account for this issue by using clustered standard errors at the organizational level. Our dependent variable is an aggregation of separate survey items which means that the variable is continuous; linear regression modelling is preferred. Heteroscedasticity can be a problem when using OLS. We controlled for

**Table 2.** Means, standard deviations and correlations.

		SD	Mean	1	2
1	Public service performance	0.93	4.75		
2	Innovating	1.14	4.7	.590**	
3	Optimizing	1.09	4.87	.663**	.658**

\*\* Correlation is significant at the 0.01 level.

this issue by using the robust standard errors option in Stata. Another potential issue is multicollinearity. The variance inflation factors (VIFs) of the independent variables are, however, all below 5 thus suggesting the absence of multicollinearity.

## ***Phase 2: qualitative analysis***

### ***Data collection***

Following this quantitative research, we did qualitative research on the innovation and optimization practices of the RWAs using focus groups. Focus group discussion is an efficient technique for qualitative data collection on personal as well as collective opinions and experiences (Robson 2002; Robinson 1999; Ryan et al. 2014). They allow for natural quality controls on data collection as participants interact and discuss and thereby tend to provide checks and balances on each other and extreme views tend to be weeded out. Furthermore, group dynamics help in focusing on the most important topics and it is more easy to assess the extent to which there is a consistent and shared view (Robson 2002; Robinson 1999).

We sent an invitation to all RWAs, 10 RWAs were willing to participate. The participating RWAs are well distributed geographically, as well as over the score range (means per RWA for innovating, optimizing and PSP range, respectively, between 3.94 and 5.8, 4.62 and 5.8, 3.86 and 5.26) and include the RWAs with the lowest (RWA1) and highest mean scores (RWA10) of the 22 water authorities. Per RWA we convened two focus groups: one with managers and one with employees. This design was chosen because the responses of the different functional groups differ significantly (managers score higher compared to process- or project leaders, and even more so compared to process- or project employees) and because of the different roles of managers and employees. This design enhances safety for employees in expressing conflicts and concerns and reduces the risk of the influence of hierarchy and power dynamics (Robson 2002). Group sizes ranged from 4 to 8, resulting in approximately 120 participants in total.

We followed a semi-open design that allowed participants to formulate personal opinions and experiences as well as explore and express collective experiences (Ryan et al. 2014) guided by the following questions: 'In relation to innovation and optimization: what characterizes the current practice within the RWA, what works well in this water authority and what could be improved?' We expected that discussion on the first questions would reveal formal and informal routines that are helpful for innovation and optimization, and the reverse for the third question. We did not question 'over-optimization' or 'over-innovation' directly, but let discussions evolve naturally around the practices of innovation and optimization in order to get a broad perspective of these practices.

We coded the transcripts of the group discussions in two steps. First, we focussed on formal and informal practices, to obtain an understanding of espoused and actual practices of innovation and optimization (Brown and Duguid 1991). Understanding the actual, non-canonical practices may help to reveal clues on the underlying mechanisms or causes for a stronger focus on optimization or innovation. We thus coded for formal strategies, policies and procedures for innovation and optimization and for informal routines, the latter including remarks on actual practices as well as remarks that reflect perceptions of norms, values and identity. The second step in our

coding consisted of identifying remarks that describe something that occurs ‘very much’ or ‘too much’, or that indicates an optimization trap or an innovation trap.

## Results

### Phase 1: quantitative analysis

Table 3 presents the results of both the linear and non-linear model. First, we discuss the linear model. This model explains about 51% of variation in PSP and is statistically significant. Both innovating and optimizing have a significant positive association with PSP, with optimizing having a seemingly stronger association (i.e. higher coefficient). Second, we discuss the non-linear model. This model slightly outperforms the linear model by explaining 52% of the variation in PSP. It is also statistically significant. Although the difference in R Square between the linear and non-linear model is seemingly small, the change in F-value does signal that the non-linear model fits the data better than the linear model. The model indicates that there is a curvilinear association between optimizing and PSP (i.e. we accept H1) but not between innovating and PSP (i.e. we reject H2). Specifically, the coefficient for optimizing is significant and positive whereas the coefficient for its squared term is significant and negative. This indicates an initially positive association between optimizing and PSP that starts to diminish the more optimization is conducted. In both the linear and non-linear model, the control variables show similar results – which indicates model stability.

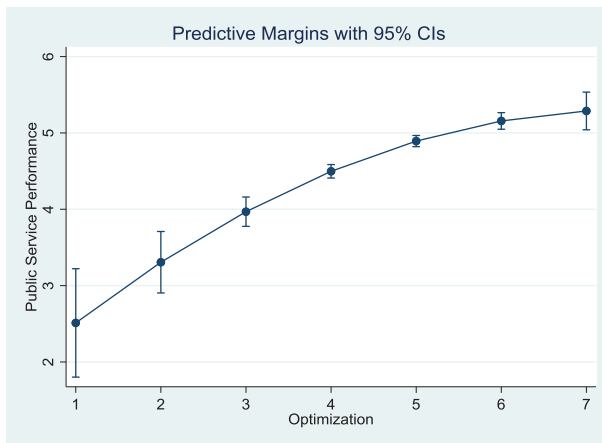
**Table 3.** Linear and non-linear models predicting public service performance.

Variables	Linear model		Nonlinear model	
	B	s.e.	B	s.e.
Constant	1.915***	.202	1.346**	.403
Innovating	.225***	.042	-.135	.208
Innovating <sup>2</sup>			.041 <sup>+</sup>	.021
Optimizing	.386***	.049	.996***	.181
Optimizing <sup>2</sup>			-.067**	.017
Function (manager is reference)				
Project leader	-.216	.142	-.236 <sup>+</sup>	.134
Project employee	-.154	.113	-.157	.102
Other	-.215*	.096	-.220*	.084
Education (university is reference)				
HBO (higher vocational education)	.031	.065	.021	.066
MBO (secondary vocational education)	-.268**	.074	-.271***	.060
Other	-.700**	.206	-.576***	.107
Task field (flood risk management is reference)				
Water quantity management	.149 <sup>+</sup>	.084	.183*	.081
Water quality management	.191 <sup>+</sup>	.094	.218*	.095
Sewage treatment	.248*	.101	.272*	.100
More than one	.072	.061	.094	.056
N	571		571	
F-value	174.73***		198.39***	
R <sup>2</sup>	.513		.524	

<sup>+</sup> p < .10, \* p < .05, \*\* p < .01, \*\*\* p < .001.

Note 1: Clustered robust standard errors at the organizational level are used.

Note 2: Our final N includes only respondents for who no missing values were found for all the variables included in the model. This reduced our dataset to 571 respondents.



**Figure 1.** Curvilinear relationship between optimizing and public service performance.

In [Figure 1](#), we visualize the significant non-linear association between optimizing and PSP including the accompanying 95% confidence interval. This figure clearly shows a ‘flattening-out’ of the contribution of optimizing, indicating that optimizing initially helps enhance PSP, but the more optimization is being conducted, the weaker the performance impact becomes.

To quantify these diminishing returns of optimization, we have added the predicted values of PSP for different values of optimization in [Table 4](#). When optimization moves from 1 to 2 on a 7 point scale, performance increases with about 11%. However, when optimization moves from 6 to 7 on a 7 point scale, performance increases with only about 2%. Clearly, these diminishing returns are significant.

### Controls

To control for potentially confounding variables, several respondent characteristics were added as controls in the model (see [Table 3](#)). We included characteristics that could potentially associate with perceived PSP (Choi and Rainey 2010), i.e. the function of the respondent (manager, project/process leader, project/process member, or other), the work field in which the respondent is active and the level of education. We constructed dummy variables for these controls to include them in the analysis. There are significant relationships with PSP for education, function and task

**Table 4.** Diminishing returns on public service performance (PSP) of more optimization.

Optimization value	PSP value	Delta-method s.e.	Delta PSP (%)	t	p-value	95% confidence interval
1	2.524	.322	7.85	7.85	.000	[1.855, 3.193]
2	3.319	.195	11.4	17.04	.000	[2.914, 3.723]
3	3.979	.102	9.4	39.13	.000	[3.767, 4.190]
4	4.504	.047	7.5	96.11	.000	[4.407, 4.602]
5	4.895	.040	5.6	123.85	.000	[4.813, 4.978]
6	5.152	.056	3.7	91.66	.000	[5.035, 5.269]
7	5.274	.091	1.7	57.70	.000	[5.084, 5.464]

field. Respondents with a lower level of education generally scored PSP a bit lower than those with a higher level of education, as do respondents with function ‘other’, i.e. administrative roles. A possible explanation may be that being in lower level functions, for which a lower level of education is required, or in administrative roles, makes it harder to overview the overall innovating and optimizing efforts as well as performance gains in a task field. Respondents from the field of flood risk management judge PSP significantly lower than respondents from other fields. This is not surprising as this is the most strongly regulated task field, with legally prescribed procedures of testing against national norms and high standards for construction and maintenance. Thus for this task field enhancing PSP is inherently less easy and presumably least necessary.

## **Phase 2: qualitative analysis**

### **Optimization**

In this section, we investigate why optimization does – as expected – have a curvilinear relationship with PSP in the RWAs. Our qualitative results support and refine our quantitative findings, as we will elaborate below. The RWAs apply results-based management, draft obligatory strategic plans, and engage in different types of formal improvement processes. They apply lean techniques, standardized and ISO-certified work processes, implemented Plan-Do-Check-Act approaches to evaluate policies and projects, and encourage improvement proposals from the work floor. The following quote of a RWA7 employee illustrates this: *‘I think we have arranged our processes for an organization that is fully geared to optimizing.’* Some RWAs focus predominantly on optimizing current processes, e.g. this RWA1 manager says: *‘Let us take care that the things we do now are within time and budget first, before we start to think about innovation’.* Some RWAs realize in hindsight that they have been focussing on optimization too long, e.g. a RWA2 manager states: *‘Now we take another route, but that took a long time, had there been someone with an innovative mind five years ago [...], it could have started five years earlier.’* Others are conscious of the risks of over-optimization: a RWA9 manager remarks: *‘But we must think of something new [...]. We are still fine-tuning our system, but that knob cannot be turned any further.’*

Underlying causes may be inferred from statements that indicate that RWAs focus too much on optimization: In RWA1 and 2 there is a strong focus on cost control. In RWA1 budgeting of resources is strict, detailed and austere. A manager of RWA1 remarks: *‘Financially we have locked ourselves in’.* An employee of RWA1 thinks that this hampers optimization: *‘You steer very much on costs, so your performance is the same against lower costs. But, as a result there is less and less space for optimization in your performance.’* In RWA2 the response to the obligatory strategic plan is one of disinterest, it is: *‘just another plan, but we will keep controlling on costs as usual.’* RWA1, 2, and 3 also feel there is too much focus on short-term results. A lack of urgency is perceived related to future challenges. Some state that they would need a long-term vision or a strategic agenda, and mention they tend to get caught in the *‘delusion of the day’.* There is a strong inward focus, e.g. managers of RWA3 mention they do not feel encouraged to explore new knowledge or developments, that joining external events is *‘not done’*, and market parties are viewed with suspicion.

In all RWAs (except RWA10) managers and employees mention a high pressure to deliver results within time and budget. They value their results-based approach, a manager of RWA8 says: *'We all value the perspective of the performing government. [...] Hours, performance, quality, accountability.'* This shared value creates a high work pressure, a manager of RWA7 states that *'work pressure is huge, prohibitive [of innovation]'*. Others mention it inhibits reflection and learning. However, managers are self-reflective of their roles: *'We create time pressure ourselves, we present a planning to the board that is too optimistic, eliminating other possibilities, [...] we pose structures on ourselves that are too tight. [...] we want to show how well we are in control'* (manager RWA6).

There is a general understanding that there are (too) many procedures, reinforcing familiar routines and fixed patterns. An employee of RWA6 states: *'I can't think of anything that we don't have a process or procedure for'*. Procedures are often installed to avoid risks: *'We create a lot of superfluous rules, out of fear something goes wrong'* (manager RWA10). The strong focus on risk avoidance and scrutinizing mistakes reinforces the focus on optimization. A RWA3 employee states: *'We don't manage risks, we try to eliminate every possible risk'*. Finally, participants address a tendency to adhere to fixed patterns, by themselves: *'You often think in the same patterns'* (RWA5 manager), or by their colleagues: *'the operational team is a bastion of traditional morals'* (RWA3 employee).

Thus, mechanisms that induce a bias towards optimization and a risk of over-optimization in the RWAs are (a) a strong focus on cost control and short-term results, (b) the pressure to perform and the role of managers therein, (c) a primarily inward focus and abounding procedures that enforce fixed patterns in thinking and behaviour, and (d) risk avoidance and scrutiny of failure and limited learning.

### **Innovation**

In this section, we investigate why the relation between innovation and PSP in the RWAs – counter to our expectation – is not curvilinear.

There are some indications in our qualitative data that RWAs may occasionally engage too much in innovation, or find it hard to implement their innovative ideas. Some board members and upper echelon managers have explicit ambitions, e.g. to belong to the top 5 of the most innovative water authorities. In RWA7 an employee notes that this ambition hampers optimization: *'Small optimizations are part of the job. They are seen as self-evident. But bigger optimizations, that we cannot do ourselves, that we need money for, become projects. And then often priority is given to innovative projects.'* In RWA9 innovation is stimulated from an organisational learning perspective, but a RWA9 employee remarks: *'We are very good in shaking the idea tree. You get a lot of ideas. But how to bring them further?'* And a RWA10 manager says: *'You see that other RWAs have faster implementation times. We have so much brain power. We are super strong in thinking, making plans, but implementation lags behind.'*

However, when referring to their innovation practices, participants more often mention that optimization and short-term results are prioritized over innovation and that managers are hesitant to engage in innovation or to allow employees to do so. Innovation takes place in a cautious and rational approach. For example, piloting and upscaling of innovative concepts has to be supported by business cases in all RWAs. In line with the findings on optimizing practices, that show a strong focus on results,

optimizing current work processes and risk avoidance, over-innovation does not seem a big risk within the RWAs.

### **Differences in strategic orientation**

However, there are differences between the RWAs. RWA1, 2 and 3 focus on short-term results and cost efficiency is mirrored by a restrained attitude to innovation, which is not considered part of their mandate and is not included in formal policies. In the Miles and Snow (1978) categories for strategic orientations they could be classified as 'defenders', i.e. organizations that take a conservative view on new developments and focus on improving the efficiency of their existing operations (Andrews et al. 2009). This is in line with the quantitative results: the mean scores for innovating, optimizing and PSP for these RWAs are below average (i.e., respectively, 3.94–4.38; 4.62–4.95; 3.86–4.79).

RWA4–8 engage in all kinds of optimizing processes, recently mostly applying lean methods (Radnor and Walley 2008), as well as in formalized innovation policies. They thus show, in terms of Miles and Snow (1978), defending as well as prospecting activities. However, they encounter difficulties synchronizing innovation and optimization, due to their results-based approach and huge work pressure that leads to considerable tension between innovation and optimization processes and to prioritizing regular activities, which induces a bias towards optimization. Besides, separating innovation in dedicated teams, projects and programs hampers integration in regular work processes, policies and regulations. Their scores for innovating, optimizing and PSP range around average (i.e., respectively, 4.57–4.99; 4.85–5.11; 4.58–5.03).

RWA9 and 10 embrace a more societal value-oriented perspective on PSP, and see optimization as a prerequisite for innovation. In their view stimulating innovation also contributes to avoiding fixed patterns in thinking and behaviour. These are the most ambidextrous organizations, 'analysers' in the Miles and Snow-typology, they continuously search for new opportunities and experiment with responses to emerging trends, as well as improve their incumbent policies, processes and services, in order to enhance their contribution to societal value. Their scores for innovating, optimizing and PSP are above average (i.e., respectively, 5.04–5.8; 5.05–5.8; 5.01–5.26).

### **Dealing with tensions**

When asked what could be improved, managers and employees mention: developing a long-term vision (RWAs 1–3), embracing a more integrative approach to innovation and optimization and ensuring better internal (RWAs 4–8) and external connections (RWA 3). They also mention that they should ask themselves and each other '*the innovation-or-optimization question*' on a regular basis (RWAs 1–8). Furthermore, all RWAs call for more comprehensive performance management systems that include measures for innovation as well as for optimization. They acknowledge that they should improve their proficiency in risk management. The RWAs also see room for improving organizational learning, ranging from merely '*closing the PDCA-cycle*' (RWAs 1–3) to improve learning '*over the policy cycle and between work floor, management and board*' (RWA 10). Finally, they mention that support of board or upper-echelon members for innovation is needed (especially RWAs 1–3).



## Discussion

Our quantitative analysis revealed that optimization initially contributes more to PSP than innovation. However, the relation between optimizing and PSP is curvilinear, as we hypothesized, indicating that at high levels of optimization the impact of even more optimization on PSP is limited. Our qualitative analysis indicates an over-engagement in optimization. Mechanisms behind over-optimization are a focus on predictable short-term results, cost-efficiency and limiting risk (Levinthal and March 1993; Uotila et al. 2009; De Bruijn 2002; Arnaboldi, Lapsley, and Steccolini 2015; Yang and Panday 2007). In line with these findings, the focus group discussions revealed a strong results-based approach and focus on risk avoidance, whereby current performance is mainly enhanced by optimizing existing policies, processes, technologies and services. However, our qualitative analysis also allowed us to refine this finding, revealing differences between the RWAs. RWAs that embrace a more defending strategy score below average on optimizing, mainly due to their strong focus on cost-efficiency, indicating that increasing their optimization efforts is still beneficial for them (Boyne and Chen 2006). As they mainly engage in optimizing they nevertheless run the risk of over-optimization, when innovation would have been more beneficial. Examples of over-optimization were mentioned by participants of these RWAs. RWAs that embrace a combination of prospecting and defending strategies encounter difficulties synchronizing innovation and optimization, as their results-based approach and huge work pressure lead to prioritizing regular activities and following existing routines, which induces a bias towards optimization, whereas the returns on their optimizing efforts already start to diminish. As such, these RWAs also run a risk of over-optimization. The scores of the more ambidextrous RWAs – ‘analysers’ in the Miles and Snow-typology – are already within the realm of diminished returns on PSP. However, they are aware that further optimization efforts of existing policies, processes and services are hardly beneficial and insufficient to answer future challenges. Because of their greater ability to combine innovation and optimization they run less risk of over-optimization.

We hypothesized a non-linear relationship between innovation and PSP, mainly based on theoretical arguments (Choi and Chandler 2015) and findings for private organizations (e.g. Uotila et al. 2009; Kreiser et al. 2013). Our quantitative results indicate that the contribution of innovation to PSP is linear, which is in line with previous public sector findings (Walker, Damanpour, and Devece 2010a; Damanpour, Walker, and Avellaneda 2009). However, the extent of innovating activities in the RWAs is relatively low. Thus, it is possible that a linear relation is found due to a range effect, which occurs if the full range of scores of the predictor variable is not included (Pierce and Aguinis 2013). Our focus group results indicate an occasional emphasis on explorative activities in the invention phase of the innovation cycle, e.g. due to ambitions of the board or upper-echelon members. However, because innovation in the RWAs is carried out within the regular decision-making and operational processes, and within strong restraints on risk-taking, over-innovation is unlikely. This confirms previous findings that PSOs tend to innovate incrementally (Damanpour, Walker, and Avellaneda 2009).

Given the strong results-orientation and restraints on risk-taking, as well as the potential improvements mentioned in the focus groups, we assume that there is room for improving PSP by enhancing innovation efforts, especially in the less

ambidextrous RWAs. More ambidextrous RWAs show more integrative strategies, embracing a 'both-and' approach (Smith and Lewis 2011; Löfstäl and Jontoft 2017) to optimization and innovation. Our empirical data nevertheless revealed 'ambidextrous behaviour' at the work floor in all RWAs, i.e. an employee or project team will choose for optimization or innovation, depending on their judgement of the problem or an opportunity at hand. However, the more ambidextrous the organization is, the easier this iteration between optimization and innovation becomes.

## Conclusions

This article yields important insights for public management research, theory and practice. We showed that optimization initially is more strongly associated with PSP than innovation, but that at high levels of optimization its contribution to PSP diminishes. We were also able to refine this finding in our qualitative analysis, indicating that, whereas defending or low ambidextrous PSOs benefit most from optimization strategies to enhance PSP, these also run the largest risk of entering an optimization trap due to their neglect or even rejection of innovation. The reverse is true for more ambidextrous PSOs.

Innovation is initially less strongly associated with PSP, but its contribution in RWAs is significant and linear, although a range effect cannot be excluded (Pierce and Aguinis 2013). As such, our results contribute to putting the 'innovation imperative' (Jordan 2014; Osborne and Brown 2011) – i.e. the high expectations of the benefits of more innovation in PSOs – in a broader perspective, indicating that both optimization and innovation contribute to PSP. More ambidextrous strategies help resolve the tensions between innovation and optimization, and therefore ambidexterity in PSOs deserves more research attention.

In addition, as prospecting RWAs score higher on PSP, our results are in line with previous findings (Andrews, Boyne, and Walker 2006) that prospecting strategies are more strongly associated with PSP than defending strategies. However, RWAs that embrace an analysing or ambidextrous strategy show the highest scores for PSP. Our findings thus indicate that an analysing or ambidextrous strategy may be even more beneficial. This category has previously been excluded from public management research (Boyne and Walker 2004; Andrews, Boyne, and Walker 2006; Andrews et al. 2009) and we encourage future work to re-assess its relevance for PSOs.

Furthermore, non-linear relations are seldom reported in public management research. Our results should trigger scholars to test for non-linearity more often. Mixed methods research can be particularly valuable when doing so because it allows to identify potential non-linear relationships between important public management constructs and, simultaneously, explain the underlying causes and mechanisms. This helps to better explain why potential non-linearity might emerge.

Our study also yields relevant insights for practitioners. For PSOs our results indicate that although optimizing is initially more strongly associated with PSP than innovation, PSOs should prepare for the moment '*the knob cannot be turned any further*', i.e. the moment that optimization no longer contributes to PSP. Moreover, the contribution of innovation to PSP remains substantial. Thus, PSOs would benefit from formulating more ambidextrous strategies, based on a comprehensive analysis of the need to either optimize or innovate, and design processes and procedures to support both. Public managers should be aware of the draw-backs of the natural

inclination to emphasize optimization and ensure that their organization engages in innovating activities in congruence with their optimizing activities, embrace the tensions between the two as beneficial rather than trying to 'regulate' them. A well-designed performance management system, that includes measures for innovation as well as optimization, may support a more ambidextrous approach. Moreover, it can stimulate learning, iterating between innovation and optimization, and counteract biases in decision-making toward optimization (Bedford, Bisbe, and Sweeney 2018).

## Limitations and future research

First, we conducted our research within Dutch RWAs. As functional democracies, they are a rather specific type of government, being tasked with water management and sewage treatment only. We thus need to show modesty towards the generalizability of our findings and encourage future research to test whether our findings hold in different contexts, e.g. multipurpose public organizations such as municipalities, or in other political and administrative contexts (O'Toole and Meier 2014). Second, our analysis could suffer from endogeneity: we use cross-sectional data, and we cannot infer causal relations, although our qualitative analyses partially mitigate this. Future research could seek to identify relationships over time and include a baseline performance variable to assess actual improvement in PSP (O'Toole and Meier 1999). Third, we based our analyses on the perceptions of organizational staff concerning the performance of their RWA. It may be interesting to test the relations between innovating, optimizing and more objective performance measures or stakeholder assessments because subjective performance assessment by managers have been known to show some skewness (Meier and O'Toole 2013). Finally, we use a comprehensive scale for PSP, aggregating several dimensions of PSP, which does not allow us to identify whether relationships differ per PSP dimension. Our results indicate differences in the correlations between the different items of optimizing and innovating with those of performance. Future research can seek to tweak out which PSP dimensions are particularly impacted by innovation and optimization and how. To conclude, we encourage future scholars to engage – using both quantitative and qualitative data – with the debate on non-linearity between optimizing, innovating and PSP to help better understand the conditions under which such non-linearity appears.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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