



### A DISCUSSION ON THE DESIGN SCIENCE PRINCIPLES IN MANAGING LARGE-SCALE CHANGE PROGRAMS IN THE PUBLIC SECTOR

### KAMU SEKTÖRÜNDE BÜYÜK ÖLÇEKLİ DEĞİŞİM PROGRAMLARININ YÖNETİMİNDE TASARIM BİLİMİ PRENSİPLERİNİN KULLANIMI ÜZERİNE BİR DEĞERLENDİRME

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#### Öz

Organizasyonel değişim programlarının yürütülmesinde karşılaşılan problemleri çözmek ve hizmet performansını iyileştirmek için kullanılan tasarım bilimi yaklaşımı son yıllarda kamu yönetimi alanındaki uygulayıcıların ve bilim insanlarının ilgisini çekmektedir. Bu yaklaşıma dayalı olarak, hem kamu hem de özel sektöre odaklanan farklı yazarlar tarafından teorik tasarım unsurlarını ve gerçek yaşam deneyimlerini birleştiren bazı temel tasarım prensipleri önerilmiştir. Bu çalışmada, ilk olarak, tasarım bilimi yaklaşımının farklı yönlerini vurgulayan çeşitli çalışmalar incelenerek üç temel tasarım prensibi tanımlanmıştır: (1) sistematik ve bilgi-temelli problem çözme yaklaşımı, (2) tasarım aşamaları arasında ileriye ve geriye doğru hareket etme, (3) problem ve çözümünün birlikte evrimi. Bu prensipler büyük ölçekli organizasyonel değişim programlarının etkili bir şekilde yönetiminde kamu kurumlarına kolaylık sağlayabilir. Ancak, kamu kurumlarının bazı karakteristik özellikleri ve bu prensiplerin içerdiği doğal uygulama zorlukları değişim programlarının başarısını kısıtlayabilir. Bu nedenle, ikinci olarak, bu prensiplerin büyük ölçekli değişim programlarının yönetiminde kamu kurumlarını nasıl destekleyebileceği üzerine bir değerlendirme yapılmış olup, kamu yönetimi çerçevesinde bu prensiplerin bazı potansiyel kısıtları üzerine bir tartışmaya yer verilmiştir.

**Anahtar Kelimeler:** Tasarım Bilimi, Tasarım Mantığı, Değişim Yönetimi, Kamu Yönetimi.

#### Abstract

Design science approach has attracted the attention of both scholars and practitioners in the area of public administration to solve the challenges of organisational change programmes as well as to improve service performance in the last decades. Based on this approach, some basic principles combining theoretical design elements and real-life experiences are proposed by different authors focusing on both public and private sector. In this article, firstly, we describe three basic design principles, which we extract from the related literature emphasising the different aspects of design science approach: (1) systematic and knowledge-based problem-solving approach, (2) moving forwards and backwards between design stages, and (3) co-evolution of problem and solution. Those principles can assist public sector organisations to manage their large-scale change programmes effectively; however, some principal characteristics of public organisations and the inherent difficulties of implementing those principles may constraint the success of the change programmes. Therefore, secondly, we attempt to shed light on how those principles can assist public organisations to manage their large-scale change programmes, and then, we discuss some potential limitations of those principles based on the public management framework.

**Keywords:** Design Science, Logic of Design, Change Management, Public Administration.

## 1. INTRODUCTION

The multi-faceted environment, including political, social and technical aspects, in which public sector organisations operate has been changing expeditiously and thus become more unstable in the last decades. Nowadays, traditional public administration, which presumes that the environment is stable and thereby requires mostly small-scale changes, has replaced by the New Public Management (Hood, 1995) and Digital Era Governance (Dunleavy et al., 2005) of which primary objectives are transforming public sector organisations from bureaucratic and process-based accountable entities to citizen-centred, market-oriented and result-based accountable bodies. Therefore, in the last decades, public sector organisations have been exposing to large-scale changes or reforms having a substantial impact on a wide range of society, and including different agents of government and a set of policy areas (Hansen et al., 2017). However, managing these changes effectively in public administration settings is not an easy task due to the “widening gulf” between the complexity of challenges of

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modern world on one hand and public sector's ability to make use of managerial and technical tools in order to surmount that complexity on the other hand (Allio, 2014). For instance, according to the results of a survey including 974 public-sector leaders in 2012, it is found that 61% of large-scale public-sector projects failed because of not meeting their targets fully (Farrell and Goodman, 2013).

Large-scale changes in public sector are actually transformational changes having the following three dimensions, described by Bevan et al. (2013): (1) multiple organisations, multiple groups across the organisation (e.g., doctors, nurses, managers etc. in a health care system) or widely spread multiple locations, (2) major changes in current models and mentality, and (3) having obvious impact on working styles of people and requiring coordination between multiple systems. Some approaches that combine theoretical principles and real-life experiences have been developed to solve the challenges of those sorts of organisational large-scale change programmes. One of them is the design science approach proposed by different authors and practitioners for managing the processes of planned organisational change in both the public and private sector. At the first glance, it can be stated that design science approach provides a systematic, knowledge-intensive and stepwise methodology in which problem and solution strategies are handled at the same time (Cross, 2008) and solve problems by synthesis which contributes to introducing a degree of novelty or creativeness into the organisational development and change programmes (Barzelay, 2012; Allio, 2014).

The amount of publications focusing on the application of the design science approach in public administration literature has been increasing over time (Hermus et al., 2020), but still the related literature is not abundant. A substantial number of authors (e.g., Van Buuren et al., 2020; Romme and Meijer, 2020; Liedtka et al., 2020; Clarke and Craft, 2019; Shangraw Jr. and Crow, 1998), addresses the importance of the design thinking or the design science approach as well as how this approach can be used in public administration. However, we have noticed that they have difficulty in specifically indicating a methodology that describes how design science can be applied in the public sector. Considering the studies that propose structured methodologies within the context of the design science approach or design thinking in the public sector, it should be noted that the most contribution to the area covers the studies of Bevan et al. (2007) and Van Aken (2007), who focus on integrating technical, business and human values in a change program, and Cross (2008). Based on those studies emphasising the different aspects of design science approach, first, we shed light on those aspects, defined as "design science principles" in this article. Then, we attempt to explain how those principles can assist public organisations to enhance large-scale change programmes and discuss their limitations in the context of public administration settings. Here, the focus is on the general idea of organisational change rather than large-scale policy changes or operational management issues, such as changing the IT structure of an organisation or a specific public service. One can refer to Kuipers et al. (2014) for a detailed literature survey on the management of change in public organizations.

The rest of this article is organised as follows. Section 2 presents design science principles handled within the context of this article, also including some fundamental definitions; and provides an evaluation on how those principles and approaches can help public sector organisations in their large-scale change programs. Section 3 establishes a discussion on their limitations in public administration context, and Section 4 presents the concluding remarks.



## 2. DESIGN SCIENCE PRINCIPLES APPLIED TO ORGANISATIONAL CHANGE PROGRAMMES

The idea of design science was firstly described by Simon (1996) as sciences of artificial that was differentiated from natural sciences whose main objective is to explain how things are; however, the main objective of artificial (design) sciences is to explain how things are plus to reveal how they should be. For instance, the focus of medicine as a design science is not only on what causes particular diseases but also on how to cure the diseases (Jordi and Bartunek, 2007), which requires to generate new knowledge on treatment methods by combining previously-produced knowledge. This description highlights the essential perspective of design science: focusing on not only problem formulation but also creating practical solutions to the problem by generating reliable knowledge innovatively. The problems handled by design science may be a construction problem, i.e., the creation of artefacts or an improvement problem, i.e., improving the performance of existing artefacts, and the solution reached (output) within design science is called as “design”, which can be a plan, a model/representation of an object to be created or instruction for production phase (Van Aken, 2007).

Now, our main question is how the design science perspective given above can be applied to organisational change programmes in the public sector. In order to answer this question, we first explain the general principles of design science applied to organisational development or change management by making use of some well-structured studies in the literature (e.g., Bevan et al., 2007; Van Aken, 2007; Cross, 2008). Then we explain how those principles can help improve large-scale change programmes in the public sector.

When we consider the general principles of design science handled in the related literature, we have noticed that different authors highlight different principles. Here, we present the basic design principles extracted from the related literature.

### 2.1. Principle 1: Systematic and Knowledge-Based Problem Solving

This principle can be defined as the hearth of design science, and instead of “trial-and-error” problem-solving approach, it provides a methodological and systematic approach that allows progressively reaching to the desired solution while increasing the value of knowledge both created during the design process and generated from previous experiences. In the context of this principle, both Van Aken (2007) and Bevan et al. (2007) propose a systematic stepwise approach and focus on the knowledge-oriented aspect of a change programme, in other words, design.

Van Aken’s stepwise approach has three main steps: (1) problem definition and defining intended performance targets (specifications) to be achieved by change programme, (2) first design, second design and formal change and (3) learning-to-perform. In the first phase that aims at bringing expertise knowledge and views of stakeholders together, a team of “change agents” is built, including management representatives, staff members and consultants/external experts. In the second phase, a first design (formal design) is made by the change agents, which is shaped in the view of professional knowledge. Then the formal design is presented to stakeholders and based on their reviews/revisions through intense interaction with change agents, and a second design is made. In the last stage, the finalized second design (change programme) is implemented, and continuously be adapted and fine-



tuned based on the lessons learned during the implementation process.

Bevan et al. (2007) also propose a stepwise approach developed during the transformational change of a huge public organisation - National Health System (NHS) in the United Kingdom in the early years of 2000. This approach has the following steps: (1) determining design requirements, (2) designing ideal outcomes of the change programme, and conceptualising and developing focused changes, (3) prototyping and testing the targeted change, and (4) monitoring the performance of each change area and their impacts on the organization. Now, we focus on the “knowledge-orientation” aspect of this approach. In the first phase, they explore similar design patterns/requirements based on the knowledge, evidence and experiences accumulated in the organization. Those patterns are defined as the solutions that have worked in previous improvement or construction programmes in the organisation. They are determined by examining the successes and failures experienced in the past, which can be used as guidelines for future change or improvement efforts. This examining process can also reveal the experiences of experts and practitioners at different levels of the organisation. For the NHS case, they carried out an in-depth analysis to find out “... the tried and tested exemplars in the NHS and other types of organisations that are already known about, and that might help in the future” and “[if there are] universal design principles for large-scale change in the health care” (Bevan et al., 2007). Thus, they explored “the best practice advice for improvement within the current system” that would be kept in mind while proceeding through the other phases. Thus, the approach helps organisations substantially systematise the process of reusing expertise knowledge, by providing previously tested solutions (i.e., “distilled experience”) to newly occurring or recurring problems. Thus, expertise knowledge and view of practitioners in the organisation can be involved into the change process. It should be noted that in the last years, the use of big data technologies that enable to handle a large amount of data generated in organisations effectively, digitalisation in operations and development of e-government technologies pave the way for accessing to the expertise knowledge easier and thus provide using this design science principle effectively in managing large-scale change programmes in the public sector.

In a nutshell, this principle ensures an inherently complex public sector large-scale organisational change program to proceed through a step-by-step methodology that makes the whole process more manageable. Besides, it provides to benefit from the knowledge accumulated in the organisation that can increase the programme’s likelihood of success as in NHS case, which includes high-risk due to covering the core processes of organisation and generally radical changes (not conventional). For public organisations, however, this principle may have some shortcomings related to stakeholder involvement, organisational learning ability and continuity of the stepwise approach, which are discussed in Section 3.

## 2.2. Principle 2: Moving Forwards and Backwards Between Design Stages

This principle suggests that the whole design process is not hierarchical, i.e., designer can move backwards or forwards between different stages and different levels of detail (Cross, 2008). Thereby, this ensures having a comprehensive and holistic view on the entire solution-based design process, and foreseeing risks and unexpected consequences at earlier stages in which the problem and early solutions are considered together.

In the approach proposed by Van Aken (2007), there is explicit forwards and backwards mechanism between first design and second design, and second design and learn-to-process steps. As



we have stated before, after releasing the first design (the ideal design developed by change agents), a new process begins in which a second design is made within the framework of the first design. The second design is constructed by the direct stakeholders, which includes the redesign of “their roles, organisational routines and strategies” based on their view and preferences. Then, this design is evaluated and discussed with the change agents and revisions are made as needed. This process continues until a version that is compromised on by the stakeholders. Besides, after implementation, the process goes back to the second stage, and revisions are made based on the lessons learned in the implementation process. Thus, the output of a backward stage is re-evaluated and revised based on what learned in successive stages by going to-and-fro. In this approach, though it is not explicitly highlighted, going to-and-fro mechanism between different stages aims at evaluating problem and solution with together, which may lead to redefining the problem context based on the knowledge ascertained in solution development or implementation stages.

In a nutshell, this principle can help public sector organisations manage the whole change program with a holistic point of view by creating synergy from the interaction between different stages of the systematic design process. For public organisations, however, this principle may have some limitations, such as increasing overall process complexity, which is discussed in Section 3.

### 2.3. Principle 3: The Co-evolution of Problem and Solution

This principle suggests that problem formulation and overall solution concepts should be handled concurrently in a planned change process, i.e. “[p]roblem and solution co-evolve in the design process” (Cross, 2008: 25). Unlike natural science that defines all problem parameters at the outset to generate a solution, design science starts with some known and some indefinite parameters of the current situation, and then explores those indefinite parameters to define the problem and solution space at the same time. In other words, the formulation of a problem, which is not fixed at the beginning, and solution ideas are developed and refined together through “synthesis and evaluation processes between the two notional design ‘spaces’—problem space and solution space” (Dorst and Cross, 2001). These two spaces inform each other. Thus, this principle iteratively leads to formulating, developing intermediate solutions, reformulating initial problem based on exploring indefinite problem parameters and solution space, and developing final solutions on the information acquired during the design process.

Bevan et al. (2007)’s stepwise approach focuses on this principle. During understanding and formulating the problem, they also explore the possible solution space at the same time in order to find similar patterns by “looking back over past failures and successes, which can lead to successful change and improvement efforts in the future”. During this process, designers move between problem formulation and potential solution exploration phases many times until reaching to a congruent problem-solution pair for the change program.

In a nutshell, this principle can help public sector organisations manage the whole change program from a broad perspective by creating synergy from the interaction between problem space and solution space. Besides, this principle is seen as the trigger of “creative thinking” in design science (Dorst and Cross, 2001). For public organisations, however, this principle may have some limitations, such as causing ambiguity in the design process, which is discussed in Section 3.





### 3. A DISCUSSION ON THE LIMITATIONS OF DESIGN SCIENCE PRINCIPLES IN THE CONTEXT OF PUBLIC MANAGEMENT SETTINGS

The design science principles given in Section 2 can assist public sector organisations to carry out their large-scale change programmes effectively. However, some particular characteristics of public organisations and the inherent difficulties of implementing those principles may restrain the success of a change programme. Now, we attempt to shed light on some of those restrictive factors.

#### 3.1. The Limitations of Principle 1

As stated in Section 2.1, this principle, systematic and knowledge-based problem solving-approach, can ensure a step-by-step methodology making the whole change program more manageable and provides to benefit from the knowledge accumulated in an organisation. However, it has the following shortcomings that might affect the performance of a change program in the public sector.

Firstly, in conventional organisational change practice, the focus is on the formal design, i.e., a kind of ideal design, and regarding its implementation and acceptability by stakeholders are seen as being of secondary importance (Van Aken, 2007). However, the design science approach gives higher importance to the second design, which takes stakeholders and learning phase, improving the performance of the new design into account. On the other hand, in conventional organisational change practice, the direct stakeholders that are generally considered as puppets, who are expected to do what they are told by the team of change agents, may turn out to be “troublesome puppets” (Van Aken, 2007). In any kind of organisational change programme, if they are not handled well by the agents, the formal design will face some serious problems during the implementation process. Therefore, the second redesign in which direct stakeholders are involved actively to evaluate the formal redesign become critical in the design science approach since the direct stakeholders become “fellow designers” instead of seen as troublesome puppets, i.e., passive recipients of change intervention. However, although the approach aims at transforming direct stakeholders seen as “troublesome puppets” into “fellow designers”, there might be an inherent and built-in resistance to any redesign revealed by direct stakeholders. Since it is not possible to move a public organisation away from politics, there is also another risk of that politicians as well as political appointees (top managers) may ignore the redesign, which impairs entire change programme.

Secondly, based on the NHS application (Bevan et al., 2007), although they determined good design patterns distilled from past failures and successes, i.e., “knowledge” guiding the entire change programme, which increase the likelihood of success, the implementation performance in different NHS organizations became varied. Therefore, even a good design is developed; it remains dependent on managerial leaders to enable it since managing and delivering of the design process or design-thinking approach is human-centred (Liedtka et al., 2020). Besides, the success of reusing the knowledge (developed from a specific setting) for a new setting, and learning and adaptation process (Van Aken’s third phase and Bevan et al.’s fourth phase) highly depends on the organizational learning ability, past failures, management’s commitment and leadership styles within the organisation. Besides, within this process, there is another challenge regarding how the experiences and learned lessons are analysed and formulated as coherent and utilisable design patterns for the next change and improvement efforts



(Bevan et al., 2007).

Thirdly, the design science approach gives importance on the role of “changing-agents” and their expertise on design science (Van Aken, 2007) and stakeholders’ constructive and active role in the organisational transformation process (Allio, 2014). However, unless the agents and stakeholders fully understand the existing knowledge, values, norms and routines of the organization, which provide guidelines for what should be changed and what should be conserved, this results in the ineffective evaluation of alternatives and making the design a tough and more subjective process.

Finally, the design science stepwise approach applied to a large-scale change programme would inherently be a long-running process that requires a sustainable commitment of top management including politicians and political appointees who are the most influential stakeholders on a change programme. However, “frequent shifts in political leadership and short tenures for political appointees” in public sector (Fernandez and Rainey, 2006) can cause a challenge for top management’s commitment for change as well as the continuity of the change program. Here, it should be noted that the role of change agents team including management representatives and staff members becomes more important for the change program and therefore ensuring a “deeper engagement” between change agents and direct stakeholders as well as change recipients (staff and other users) is crucial for the success of design science approach when it is used for managing the large-scale programmes of change (Naar and StangValand, 2014).

### 3.2. The Limitations of Principle 2

This principle, moving forwards and backwards between design stages, can help public sector organisations to manage a change program by creating synergy risen from the interaction between the different stages of the systematic design process. However, it has the following shortcoming that might affect the performance of a change program in the public sector.

As stated in Section 2.2, this principle suggests an iterative approach (or forwards and backwards mechanism) between the first phase whose output is the formal design developed by change agents and the second design in which stakeholders’ views are conveyed into the design process. After the formal design is prepared and presented to stakeholders, revisions are made by the change agents. Then an intermediate version of the formal design is re-presented to stakeholders, and this to-and-fro process continues until a version on which stakeholders and change agents reached to a consensus. At this point, one of the challenges is that this iterative process may cause spending too much effort for negotiation and conciliation carried out among stakeholders, and between stakeholders and change agents. This may sometimes cause to deviate from the main goals of the large-scale change programme. When we consider the hierarchical and bureaucratic nature of public sector organisations, managing this iterative process would become more complex, and stakeholders’ interest in the change process may substantially go down. Furthermore, if they have different interpretations or perceptions (sometimes competing with each other) about the expected primary outcomes of change programme, organisational priorities and mission of the organisation can cause disagreement on goals of the change program, fatalistic mind-sets on difficulties of change (Chun and Rainey, 2005) and propensity to realising sometimes conflicting goals. This situation is similar to the “goal ambiguity” concept which is described as Chun and Rainey (2005: 2) as “... the extent to which an organizational goal or set of goals (which represent the desired



future of the organization) allows leeway for interpretation”.

### 3.3. The Limitations of Principle 3

This principle, the co-evolution of problem and solution, can help public sector organisations to manage a change program by creating synergy risen from the interaction between the problem space and solution space. However, it has the following shortcoming that might affect the performance of a change program in the public sector.

As we have already stated in Section 2.3, this principle starts with some known and some indefinite parameters of the current situation, then explores those indefinite parameters in order to formulate the problem and solution space at the same time (Dorst and Cross, 2001). It means that at the beginning of design process the problem is not stable (fixed) since it is allowed to evolve during the process, which causes by nature ambiguity about the problem as well as a solution until finding a congruent problem-solution pair. When we consider the complexity of large-scale change programmes, this ambiguity may aggravate. However, tolerating or being comfortable with ambiguity during the process is one of the skills of designers (Pollock, 2012). Therefore, the role of professional designers becomes more critical for a design process, as also highlighted by Van Aken (2007). Within the context of this principle, unless organisations benefit from professionals in the area, who can tolerate and manage inherent ambiguity across the organisation during the design of change programme, the process may be perceived as complicated and unfocused that may cause staff members and direct stakeholders to lose their attention on the main goals of change programme, the change programme may result in unsuccessful outcomes.

## 4. CONCLUSIONS

In this article, we briefly present how design science principles can assist large-scale change programmes in the public sector and discuss their limitations within the context of public administration settings. The main conclusions filtered out can be given as follows.

Firstly, all those principles require long-term efforts, however, because of frequently changing political leadership and short tenures of top managers can cause a risk for the sustainability of this long-term process. At that point, it should be noted that the role of change agents becomes critical for the continuity of the process. Therefore, the team of change agents, including design experts, consultants, medium-level managers and relevant staff, should be formed carefully.

Secondly, since the principles handled in this article are human-centred, the success of change process would be highly dependent on politicians' and top managers' commitment and how well they understand the informal part of the organisation, i.e., norms, values, routines and expectations of people working in the organisation. For instance, because of inherent and built-in resistance to any redesign revealed by direct stakeholders, they may ignore the redesign and proposals of change agents about the formal design. At that point, we can say that if a “deeper engagement” between the change agents, politicians, top managers and other stakeholders is built, this problem may be solved to some extent.

Thirdly, stakeholders, change agents and change recipients may have different perceptions about the outcomes of the organisational change programme at the early stages of the design process and this





may cause a goal ambiguity about the change programme. This is a fundamental challenge occurred at the beginning of all change programmes; however, the principle which suggests co-evolution of problem and solution may aggravate this challenge since it inherently causes an ambiguity about the problem and potential solutions till obtaining a compatible/coherent problem-solution pair. As a result, the process may be perceived as complicated and fatalistic mind-sets arise. Here, we can suggest that organisations should benefit from design science professionals, by incorporating them into the team of change agents, who can tolerate and manage inherent ambiguity across the organisation during the design process.

Finally, we can say if adequately implemented, the design science principles can be beneficial for managing large-scale organisational change programme and maximizing its effectiveness, albeit their shortcomings. Here, it should also be noted that even if there is remarkable literature on implementing design science perspective to organisational change management, most of the studies are primarily shaped by a private sector point of view. Therefore, more researches on the impact of the design science principles and approaches on change programmes in the public sector should be conducted, and more specific approaches, like the approach developed for the NHS case, which takes complex public administration realities into account should be developed for the public sector.

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