Mapping Design Capability of Governments: *A Tool for Government Employees' Collective Reflection*

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With the increasing phenomenon of governments adopting design approaches, their one-size-fits-all kind of training or blind adoption without the understanding of their current capability has reported various limitations. This study introduces an instrument entitled the Design Capability Mapping Tool (DCMT), aimed at engaging government employees to identify their current practices and awareness of design, and organizational conditions for the design capability development. The Design Capability Mapping framework and tool were developed through an extensive literature review and a pilot study. Then it was applied in three government organizations in Singapore. The mapping findings identified each organization's status encompassing multiple aspects of design capability and organization-specific challenges. The strength of the DCMT was to enable employees' collective reflection, instead of management's assessment, and provide a holistic and practical assessment tool that could inform future strategies for sustained design capability development.

Keywords **–** Design Capability, Design Method, Government, Public Sector, Design Management.

Relevance to Design Practice **–** The Design Capability Mapping Tool provides a conceptual framework to understand multiple aspects of design capability in the government context and a holistic and practical tool for government's design and innovation teams to assess their organization's current design capability and develop informed future strategies for effective design adoption.

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Introduction

Design has been recognized as a potential approach to deal with complex societal challenges as it offers a human-centered, solution-oriented platform for multidisciplinary professions' collaboration (Bason, 2010; Dorst, 2015). This potential has driven governments to adopt design to empower their employees to tackle ill-defined problems and increasing demands from citizens (Bason, 2010; Body, 2008; Junginger, 2015; Kimbell & Bailey, 2017; McGann et al., 2021). The early phase of design adoption in governments often involves procuring design-driven projects for external design consultancies (Park-Lee, 2020). However, the success of design-driven projects with external consultancies depended on the government employees' knowledge of design and reasonable expectations for project management (Kimbell, 2015; Malmberg, 2017; Yee & White, 2016). Governments then started to focus on developing their internal design capability instead of fully relying on external expertise. They launched training programs for their officers to learn design methods (Holmlid & Malmberg, 2018; Kim & van der Bijl-Brouwer, 2019), and set up in-house innovation labs to champion design adoption and institutionalize design-related practices (Bason, 2010; Kimbell, 2015; Tõnurist et al., 2017; Komatsu et al., 2021). Despite those efforts, multiple challenges have been reported. Design training often ended up one-off (Malmberg & Wetter-Edman, 2016) without much effort to contextualize topics and approaches for public officers' work challenges. Public officers in the training have different levels of interests and design knowledge, thus one-size-fits-all kind of training or blind participation in the projects did not lead to fruitful learning outcomes (Holmlid & Malmberg, 2018).

The reported challenges indicated a need for governments to understand their current practices and awareness about design, as well as organizational conditions, for the effective design adoption and the sustained development of design capability. According to Junginger (2015), design legacy of every government organization should be understood for successful integration of design. She introduced the Organizational Engagement Matrix as a conversational piece to probe into government's practices for design and citizen involvement. Design Council (2013) developed the Public Sector Design Ladder to map different levels of design adoption in the public sector. A few studies conducted participatory observations in the government organizations to investigate the antecedents and barriers to design capability building (e.g., Malmberg, 2017). Besides such higher-order frameworks or ethnographic studies, there is a lack of research that offers frameworks or instruments for governments to map their current status of design capability aimed at future strategies building.

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Responding to this gap, this research explores ways to enable governments to map their design capability, by engaging government employees in collective reflection on their current work and organizational conditions. We developed a tool entitled the Design Capability Mapping Tool (DCMT) based on the literature reviews on design management, public sector design, and public administration, and tested it with three government organizations in Singapore. This paper introduces the framework of the design capability in governments and the development of the mapping tool, followed by the case study of its applications. Through the case study findings, we demonstrate what learning the DCMT can generate for government organizations through employees' participation and reflection, which inform current discrepancies and future implications for the sustained development of design capability. We discuss the benefits and future development needs of the DCMT.

Literature Review

Multiple Layers of Design Capability

As Malmberg (2017) puts it, the concept of design capability is eclectic. Much literature on design and management discusses various aspects about design capability in terms of an organization's ability to take in and use design in its innovation activities (e.g., Storvang et al., 2014). Malmberg has recognized three patterns of design capability: as design resources; as awareness of design; as structures that enable the use of design. Taking her identification of the three patterns as a base, we conducted a narrative review of the literature from design, design management, and management and organization studies that discuss design capability, to further define each pattern and how those patterns interdependently contribute to an organization's design capability.

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The first pattern, design resource is concerned with design proficiency or competence of individuals about how one possesses design skills and conducts design activities (Beltagui et al., 2011; Rae, 2015; Wormald & Evans, 2009). This is also known as *the designerly way of thinking and doing* (Cross, 2004; Dorst, 2011), often characterized as integrative thinking, creativity, empathic skills, and the ability to frame and reframe problems. The skills for user research, design facilitation, prototyping, and visualization are also part of design competence (De Mozota, 2008; Le Masson et al., 2011; Saviranta & Eloranta, 2014). Organizations can acquire these kinds of design competence by hiring design-trained personnel or training their existing employees. In this sense, design competence possessed and practiced by individual employees are referred to as design resources to be acquired, managed and allocated (Malmberg, 2017).

The second pattern has to do with an awareness of design in terms of how one acknowledges roles of design in an organization to be able to deploy it effectively (Acklin, 2013; Moultrie et al., 2007; Ramlau, 2004). Bailey (2012) stressed that the development of design awareness alongside design resources is critical for the development of an organization's design capability. While design resources are held by individual employees of the organization, design awareness is concerned with a shared understanding of available design resources within the organization, as well as the organization's routines that support the awareness (Acklin, 2013; Body, 2008). A few precedent studies on organization's design awareness highlight that ignorance of *design legacy* of the organization (Junginger, 2015) or misaligned understandings of design values (Sangiorgi et al., 2016) hinder successful design adoptions.

The last pattern is concerned with an organizational structure that enables effective use of design and sustainable development of design resources and design awareness (Acklin, 2013; Hesselmann & Walters, 2013; Wrigley & Bucolo, 2012), which is closely connected to management (Body, 2008). Mutanen (2008) emphasized that the management of design as a capability is strongly interlinked with the decision-making structure, provision of resources to design, and knowledge management of the organization. Although there are sufficient design resources and awareness, a sustained design capability in organizations cannot be achieved without conducive organizational structures (Acklin, 2013).

The literature review suggests that the three patterns are interlinked and form multiple layers of design capability that influence each other. Design resources acquired in an organization can be nurtured and effectively utilized in accordance with an increased and proper awareness of design, which is dependent on an organizational condition that forms knowledge management and decision-making structures.

Mapping Design Capability

There have been continuous efforts to develop measurement frameworks for the design capability of business organizations (e.g., Acklin, 2013; Artefact, 2015; De Paula et al., 2018; Heskett

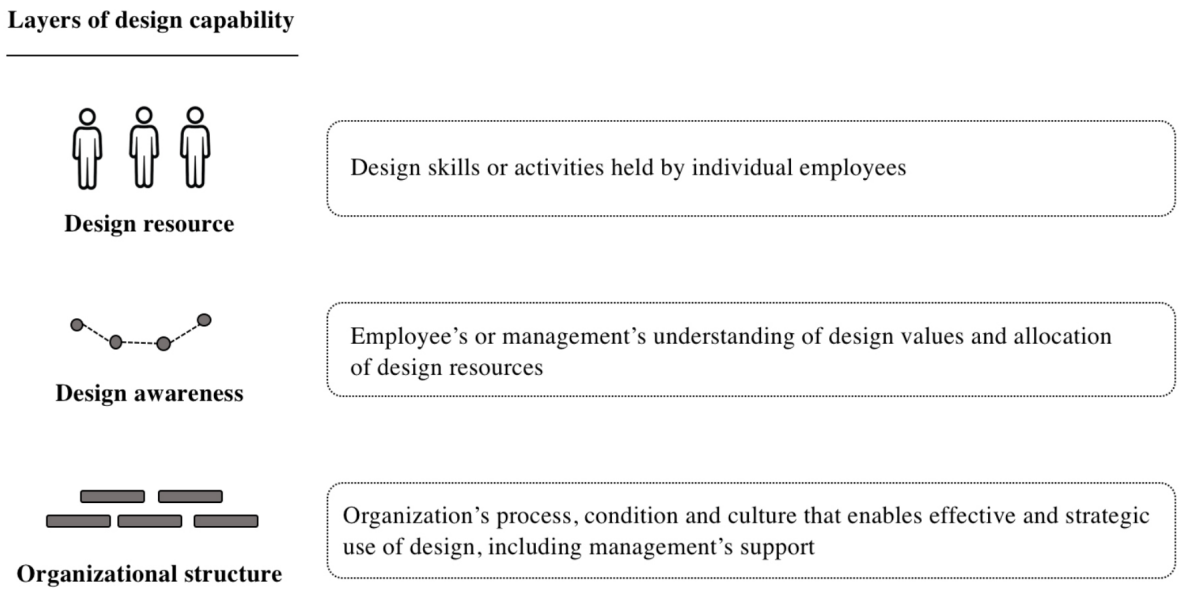

Figure 1. Three layers of design capability from the individual level to the organizational level: design resource, design awareness, and organizational structure.

& Liu, 2012; Ramlau, 2004; Storvang et al., 2014). Heskett and Liu (2012) introduced the Design Capability Radar Chart to reflect an organization's design capability from a managerial perspective. This model focused on internal strategies and operational structures related to design work, such as organization's size, formalization of internal design processes, ownership of design work, and so on. Storvang et al. (2014) advanced Heskett and Liu's model into the Design Capacity Framework, by including user involvement and innovation drivers. As a similar version, the Design Thinking Capability framework was introduced by De Paula et al. (2018). These existing studies identified multiple aspects that determine an organization's design capability, with a focus on managerial agenda. While the managerial perspective to measuring design capability might offer a big picture, often in a quantitative way (e.g., Storvang et al.), it presents design resources according to their human resource development plans, and design awareness and organizational structures according to the management's agenda. Those existing studies cannot address employees' actual practices and awareness under the managerial agenda.

The attempts to include employees' practices and awareness as part of design capability are found in design consultancies that introduced more practical tools to survey organizations' design capability as part of their consulting services (e.g., The Moment, 2014; Artefact, 2015). Those tools are online surveys using a Likert scale to be easily applicable to many employees. The results could serve as a practical matrix to quantify capability, as the replies could be categorized into areas of weakness and strength. However, due to the nature of the quantitative survey, the results did not explain the rationales behind the employees' perceptions.

While the development of design capability in the commercial sector is often motivated for a competitive advantage in the market (De Mozota & Kim, 2009), different motivations have been discussed in the public sector, such as civic engagement and political and civil service management (Bason, 2010; Body, 2008; Design Council, 2013; Junginger, 2015). These differing motivations introduced different models to map the government's use and maturity of design. For example, the Public Sector Design Ladder by the Design Council (2013) introduced three levels of design roles in the context of social problem-solving and policymaking. Junginger (2015) developed a matrix for governments' varying agenda for civic engagement. Malmberg (2017) emphasized an organizational process and structure to be considered as a crucial part of government's design capability, as the conventional work culture and structure in the government are seen as barriers to successful integration of design knowledge.

The literature review suggests that most studies on design capability focused on the commercial sector, and little empirical research has been undertaken on the design capability mapping of governments. In this study, the design capability mapping considers government's motivations for design adoption, such as civic management and innovation, and barriers, such as functional silo structure, result-focused culture, and policy actor-driven management. As agreed by Bason (2010) and Malmberg (2017), overcoming these barriers is precisely the motivation for government organizations to develop their design capability.

Design Capability Mapping Framework

Mapping Dimensions and Topics

The review of the existing studies informed the development criteria of the design capability mapping tool for governments. Firstly, the mapping should holistically address the multiple aspects of design capability, including design resources, design

awareness, and organizational structure. These aspects should consider public officers' practices and experiences that interact with the organizational structure (Lin, 2014; Karpen et al., 2017). Secondly, mapping topics should be relevant to the public sector and accountable for public officers, instead of commercial sectors. Lastly, the mapping should consider not only the management's perspective for strategy development but also the engagement of government employees for their reflection. By doing so, the management can identify gaps between their strategy and reality, and the employees can self-reflect on their current design competence and development areas. The existing frameworks, such as the Public Sector Design Ladder (Design Council, 2013) and the Organizational Engagement Matrix (Junginger, 2015) remain in high-level taxonomies, which impose limitations to address the multiple layers of design capability and delve into phenomena of employees' practices.

With these criteria, we conducted a thematic literature review (Grant & Booth, 2009) to identify mapping topics. To apply multiple aspects of design capability in the public sector context, we firstly took organizational design capacity dimensions by Storvang et al. (2014), highlighting *user involvement, roles of design in the internal process, the degree of design-driven innovation, management's awareness of design*, and *allocation of design resources*, as starting points, where we juxtaposed what are addressed as capabilities and potentials of, or barriers to, design in the public sector, from the literature from public sector design and public administration. The first author reviewed the literature and mapped and classified relevant topics first. Then the identified topics were reviewed, reclassified, and refined together with the whole research team through several iterations. During the iterations, the design capability topics were detailed and refined by the literature from design management and human-centered design, too.

During these iterations, the initial dimensions have been modified and reclassified into the four higher-order dimensions. While *user involvement* remains as *user*, highlighting employees' perception of citizen roles and practices of citizen involvement, *roles of design in the internal process* and *the degree of design-driven innovation* were integrated into *design project*, incorporating employees' ability to frame design-driven projects. A new dimension, *implementation* was added as many studies from the public sector design emphasize the iterations and cross-departmental collaboration for implementation as important factors for successful design integration and sustained design capability (e.g., Bason, 2010; Blomkamp, 2018; Kimbell & Bailey, 2017; Pirinen, 2016). Lastly, *management's awareness of design* and *allocation of design resources* were synthesized into *organizational structure*. As a result of the thematic review, a total of 12 mapping topics were classified into these four dimensions as described below.

Dimension 1: User

The *user* dimension inquires citizen-centricity in public officers' mindset and work against their conventional system-centered decision making. This dimension includes three mapping topics as follows:

- **Whom public officers perceive as their users:** Citizen-centeredness has been a key driver for governments to adopt design (Body, 2008; Carstensen & Bason, 2012; Hyvärinen et al., 2015; Junginger, 2015), against public officer's expert mindset and system-centered decision-making practices (Bason, 2017; Kimbell, 2015; Pirinen, 2016). A more recent notion in public administration and the public sector design expanded the scope of users, towards a network of citizens and various stakeholders as a complex entity of users to achieve networked governance (Voorberg et al., 2015).
- **How public officers understand user roles in their work:** The roles of users in human-centered design have evolved from being passive informants to critiques to holistic user experiences to co-creators (Kujala, 2003; Keinonen, 2010; Sanders & Stappers, 2008). How the officers perceived roles that users could play and contribute to public problem-solving, indicates their different levels of awareness and maturity of user involvement (Junginger, 2015).
- **How public officers involve users in their work:** The evolution of user roles introduced new methods for user involvement, such as participatory design and co-creation (Keinonen, 2010; Van der Bijl-Brouwer & Dorst, 2017). Despite the recognition of the importance of user involvement, public officers may remain in conventional practices of no involvement or indirect involvement through secondary research. The literature highlights the need to equip public officers with new skills and competence to facilitate user involvement to derive insights from user experiences (Blomkamp, 2018; Clarke & Craft, 2018; Design Council, 2013; Hyvärinen et al., 2015).

Dimension 2: Design Project

The 'design project' dimension inquires about the officers' awareness of design contributions in their work and competence to initiate a design-driven project and frame project aims. The following topics are included in this dimension.

- **How public officers understand roles of design:** Different levels of design roles in organizations indicate the design maturity of the organizations, from design for marketing, for styling to problem-solving to design for organizational strategy (Ramlau, 2004; Storvang et al., 2014). In line with this, in the government context, design can be used for discrete usability problems, officers' day-to-day work, or policymaking (Design Council, 2013). How officers understand holistic and strategic roles of design in public problem solving is an important part of the government's design capability (Clarke & Craft, 2018).
- **How public officers frame project aims:** The impact of design-driven projects is determined by officers' competence and organizational structure to initiate and manage a project (Junginger, 2015). Governments may still follow a predefined brief by the senior management due to the management-driven decision-making culture (Bason, 2010, 2017; Junginger & Bailey, 2017), rely on external design consultancies to frame problems (Park-Lee, 2020), or identify project aims based on

user findings and cross-department collaboration (Tõnurist et al., 2017). Problem framing expertise is critical for public innovation, which can be developed through officers' involvement in design practices (van der Bijl-Brouwer, 2019), to go beyond their reactive approach to problems (Bason, 2010; Christiansen, 2013, Kimbell, 2015; Yee & White, 2016).

- **How public officers ideate new solutions:** The practice of policymaking has been evidence-based, working around predefined solutions (Bailey & Lloyd, 2016; Kimbell, 2015). The abductive and provisional approach of design has not been welcomed (Kimbell, 2015). In addition, the top-down and system-centered decision-making structure of governments discouraged the proposal of new ideas (Bason, 2010). Thus, public officers' ability to manage the creation of new ideas based on active ideation and co-creation with citizens and other stakeholders (Hyvärinen et al., 2015; Pirinen, 2016; Nesti, 2018), is an important component of design capability.

Dimension 3: Implementation

The *implementation* dimension inquires the decision-making and collaborative process of implementing ideas and practices of prototyping.

- **How public officers select solutions for implementation:** Governments' problem-solving work pattern (Lee, 2020) and tendency to zero-error (Christiansen, 2013; Mulgan, 2014) often lead to select immediately implementable ideas. The hierarchical culture of governments also hinders collaborative decision-making based on user needs (Bason, 2017; Pirinen, 2016). How officers make decisions for implementation, whether to follow senior management's suggestion or citizen feedback indicates their design capability.
- **How public officers prototype and iterate:** Experimentalism is foreign to governments (Mulgan, 2014; Kimbell & Bailey, 2017), and they have a very narrow view to failure (Bason, 2010). This perspective has discouraged them from experimenting with prototypes (Bailey & Lloyd, 2016; Pirinen, 2016). Prototyping capability and an iterative culture require officers' cumulative efforts and management's sustained support (Kimbell & Bailey, 2017).
- **How public officers collaborate for implementation:** Many design-driven projects in governments faced challenges to bring project outcomes to practice due to their siloed work culture and job rotations (Buchanan et al., 2017; Pirinen, 2016; Yee & White, 2016). Project championship and a joined-up process are required for impactful and sustained implementation (Blomkamp, 2018; Christiansen, 2013; Design Council, 2013).

Dimension 4: Organizational Structure

The *organizational structure* dimension focuses on the structure that might enable or hinder sustained design practices and capability development. Challenges or opportunities experienced by public officers on the organizational structure should be identified and addressed.

- **How new knowledge is shared:** A shared awareness of design among employees has been highlighted as an important factor for design capability (Holmlid & Malmberg, 2018; Storvang et al., 2014). A lack of cross-departmental and organization-wide knowledge sharing programs was identified as a barrier in governments (Bailey & Lloyd, 2016; Malmberg, 2017; Pirinen, 2016). An organizational structure that supports learning by doing through project participation and creating a community of practice contributes to an increased design capability (Holmlid & Malmberg, 2018).
- **How design competence is distributed:** The degree to which an organization has a systematic structure of using design, from no internal competence to sporadic adoption to a dedicated internal team to cross-departmental collaboration, determines an organization's design capability (Storvang et al., 2014). The standardized process of using design and organization-wide awareness enable an increased design capability (Design Council, 2013; Sangiorgi et al., 2016; Tõnurist et al., 2017).
- **How the management supports design:** Government leaders were observed to be impatient to see the results of change and regarded to be motivated entirely in innovation that has the potential to receive the public limelight (McGann et al., 2018). The management's awareness of design enables resource allocation conducive for innovation (Bailey & Lloyd, 2016), and to overcome organizational barriers (Bason, 2017; Junginger, 2017). How the management creates an environment for long-term experimentation and co-creation instead of being high-handed to control, was recognized to contribute to design capability (Bason & Austin, 2019).

Mapping Instrument

The selected mapping topics and capability criteria formed a DCMT framework and were turned into a tangible instrument. The capability criteria were broken down into the four stages of design capability, to enable systematic mapping for each topic (see Table 2). The four stages span from *no conscious effor*t, to *initial*, to *applied* to *integrated*: first, the stage of *no conscious effort* exhibits the government's status quo without conscious efforts of adopting design, often characterized as the top-down, evidence-based decision-making process, siloed and system-centered work (Bason, 2010; Christiansen, 2013); secondly, the *initial* stage refers to where there is an awareness of citizen-centricity and the management is interested in adopting design yet the organization does not have internal capability to apply design approaches in their work; thirdly, the *applied* stage refers to where the government employees have capabilities to utilize design approaches for various problems and citizen-centricity is an influential factor in their decision-making; lastly, the *integrated* stage refers to where design is embedded in the organizational process, enabling citizen-centered and collaborative networked governance (Voorberg et al., 2015).

As a tangible instrument, a survey format was chosen by formulating the mapping topics into a set of questions and the capability descriptions for the four stages into multiple-

Table 1. The design capability mapping topics and capability criteria.

Mapping topics	Capability criteria	Key literatures
1. User: Public officers' understanding of customers and their practice of user involvement		
Definition of users	How much officer's work and mindset are oriented to end-users (citizens) instead of the organizational system or the management	Body, 2008; Carstensen & Bason, 2012; Junginger, 2015; Hyvärinen et al., 2015; Kimbell, 2015; Pirinen, 2016; Voorberg et al., 2015; Bason, 2017.
Roles of users	How officers understand the roles of citizens in their work, whether as demographics, as holistic and dynamic human experiences, or as creative co-creators	Kujala, 2003; Sanders & Stappers, 2008; Keinonen, 2010; Junginger, 2015.
User involvement	How officers involve citizen information in their work and synthesize data for a holistic understanding of user experiences	Keinonen, 2010, Design Council, 2013; Hyvärinen et al., 2015; Kimbell & Bailey, 2017; Clarke & Craft, 2018; Blomkamp, 2018.
2. Design Project: Public officer's perception on roles of design and their ability to initiate a design project		
Roles of design	How officers understand the roles of design, whether as styling, as skills to improve touchpoints, as a logic to innovate services and policies, or as a strategic agenda for organizational transformation	Buchanan, 2001; The Danish Design Centre, 2001; Design Council, 2013; Storvang et al., 2014; Clarke & Craft, 2018.
Project framing	How officers initiate a design-driven project, whether by following the management's mandate, by relying on existing data or external design consultancies, or by identifying project aims from customer research and cross-departmental collaboration	Bason, 2010; Christiansen, 2013; Junginger, 2015; Kimbell, 2015; Yee & White, 2016; Junginger & Bailey, 2017; Bason, 2017; Tõnurist et al., 2017; van der Bijl-Brouwer, 2019; Park-Lee, 2020.
Ideation	How officers manage the creation of new ideas, whether by following senior management's suggestions, by relying on best practices and predefined solutions, or by active ideation and co-creation	Kimbell, 2015; Hyvärinen et al., 2015; Bailey & Lloyd, 2016; Pirinen, 2016; Nesti, 2018.
3. Implementation: Public officers' decision-making and collaborative practices for implementation		
Decision making	How officers make decisions for implementation, whether by following senior management's suggestions or by prototyping and testing with citizens	Christiansen, 2013; Mulgan, 2014; Yee & White, 2016; Pirinen, 2016; Bason, 2017; Lee, 2020.
Prototyping and iteration	How officers prototype and iterate in their work, from no prototyping to iterating with various fidelity prototypes tested with citizens	Bason, 2010; Mulgan, 2014; Bailey & Lloyd, 2016; Pirinen, 2016; Kimbell & Bailey, 2017.
Collaboration for implementing	How officers collaborate for implementation, from no commitment after the project, to regular communications with implementation departments, to collaboration throughout the project	Design Council, 2013; Christiansen, 2013; Yee & White, 2016; Pirinen, 2016; Buchanan et al., 2017; Blomkamp, 2018.
4. Organizational structure: Organizational structure enabling sustained design practices and capability development		
Knowledge sharing	How the organizational structure supports knowledge-sharing, from no internal process to an organization-wide system for participatory learning	Storvang et al., 2014; Pirinen, 2016; Bailey & Lloyd, 2016; Malmberg, 2017; Holmlid & Malmberg, 2018.
Competence distribution	How the organization has a systematic structure for using design, from no internal capability to sporadic adoption to a dedicated internal team with cross-departmental collaboration	Design Council, 2013; Storvang et al., 2014; Sangiorgi et al., 2016; Tõnurist et al., 2017.
Managerial support	How the management supports employees' learning and practice of design, from little support to launching training programs to enabling a work environment for the sustained and co-creative practice of design	Bailey & Lloyd, 2016; Junginger, 2017; Bason, 2017; McGann et al., 2018; Bason & Austin, 2019.

choice options. The survey format targeted to help government employees easily go through the questions and select the relevant options so as to map their current experiences and knowledge, as validated by Artefact group's (2015) work with the Design Maturity Survey tool, and Sangiorgi et al.'s (2016) work with the Service-Dominant Logic Inquiry tool.

The pilot version of the DCMT framework was reviewed by three public officers from the in-house design unit in one of the case organizations (case 1: workforce ministry) to ensure that the questions and language were relatable and understandable by public officers. For example, they feedbacked that the term *user* might not be clear to public officers. Incorporating their feedback, we changed the title of Dimension 1, *user* into *customer* and finalized the mapping questions and multiple-choice options of the DCMT as presented in Table 2.

The physical survey format of the DCMT presents the mapping questions for each dimension in one page to ensure that officers could view all mapping questions per dimension on a single page (see Figure 2). By going through the various questions, it was targeted that officers could learn what topics are considered important in terms of design capability. The presentation of the four capability stages in a spectrum targeted for officers to learn about what would be the alternatives, if they want to advance their capability.

The mapping procedure for the DCMT starts with individual mapping followed by a group discussion. First, officers would answer the DCMT individually based on their experiences. Then the officers participate in a group discussion where they share and compare their mapping outputs with the answered DCMT sheets and discuss differences, commonalities, and reasons. This group discussion aimed to enable collective reflection to tackle a shared or misaligned awareness of design and organizational issues. The following section explains the mapping procedure in detail through cases.

Cases

Three Government Organizations

The DCMT was applied in three government organizations in Singapore. The three organizations were selected to cover a diversity of industries with different scopes of public administration and stakeholders. The three organizations started to adopt design as the senior management's mandate but varied in histories of adopting design. For example, Case 1 established an in-house design unit almost ten years ago; Case 2 had just started an internal innovation unit as a task force at the time of mapping; Case 3 has tried various design-related training but did not have an inhouse design team. These differences formed different motivations and contexts for them to apply the DCMT as explained below. Our aim in selecting these three organizations with different contexts, in terms of industries, operation scopes and design adoption histories, is to probe what kinds of organization-specific findings the DCMT could reveal.

Table 2. The design capability mapping framework for governments.

Questions (Topics)	No conscious effort	Initial	Applied	Integrated
Dimension 1: Customer				
Who are your customers? (Definition of customers)	They are the senior management and political office holders	They are our partners or intermediaries, such as external service providers or other agencies	They are citizens whose lives our services or policies influence	They are citizens, experts, senior management, other departments who can co-create with us
What roles do citizens play in your work? (Roles of customers)	Represent trends through demographic statistics	Feedback from customer satisfaction survey that tells what went wrong	Active informants whose experiences are understood in the development process	Active co-creators whose ideas are contributed to the development process
How do you gather information about citizens? (Customer involvement)	Desktop research on past projects and historical data	Rely on external consultants or frontline staff for user data	Conduct surveys, interviews or observations	Involve citizens in the design process to hear their opinions and co-create ideas
Dimension 2: Design Project				
How do you define design in your work? (Roles of design)	It is a skill to develop our communication materials and technologies	It is a set of tools to solve problems by understanding the needs of citizens and stakeholders	It is a strategic agenda to transform our work process to be human-centered, creative, and collaborative	It is a holistic, joined-up practice used for policymaking to implementation
How do you frame a project aim? (Project framing)	Focus on gaps addressed by senior management or statistics	Focus on customer complaints directly or rely on external agencies for customer problems	Identify citizens' challenges and experiences from customer research	Collaborate with citizens and other departments to understand how problems are connected
How do you come up with ideas? (Ideation)	Develop ideas based on internal senior management's suggestions	Collaborate with consultancies to conceptualize ideas	Conduct ideation sessions involving different levels of employees	Co-create ideas with relevant stakeholders and citizens

Table 2. The design capability mapping framework for governments (continued).

Questions (Topics)	No conscious effort	Initial	Applied	Integrated
Dimension 3: Implementation				
How do you decide which ideas to implement? (Decision making)	Seek senior management's decision and select ideas that are immediately implementable	Review ideas with relevant teams and experts	Create prototypes and test them internally	Prototype the ideas and collect feedback from end-users and other stakeholders
How do you prototype and test? (Prototyping and iteration)	We do not prototype ideas	Procure high-fidelity prototyping and end-user testing to external consultants	Develop low to mid fidelity prototypes internally or in collaboration with consultants	Do several iterations of low to high fidelity prototypes and test them with citizens and stakeholders
How do you collaborate to implement? (Collaboration for implementing)	Hand over key information for implementation and my role is done	Monitor the implementation process and correspond regularly with implementation teams	A few members from the project participate in implementation	Collaborate with implementation teams throughout the project till implementation
Dimension 4: Organizational structure				
How is knowledge about the design-driven project shared? (Knowledge sharing)	Reports are submitted to the management and relevant teams	There is a practice and channel to document the project and archive the cases that all employees can access	We have organization-wide regular practices for showcasing and discussing learnings via events, workshops, or online forums	We are encouraged to involve various stakeholders and other relevant teams during the project for their participatory learning
Who is involved in design and development? (Competence distribution)	We procure the design and development to external companies	There are individuals who use design tools on an ad-hoc basis or collaborate with external consultancies	There is a dedicated internal team with a formalized design process	There are organization-wide internal design processes and collaboration frameworks that involve all levels of organization
How does the management support employees to use design? (Managerial support)	There is little support and interest from the management	We are encouraged to attend training programs to learn design processes and methods	We are supported to experiment with new methods and ideas, with some resources	We are supported to create collaborative design projects among cross-functional teams, other agencies, or external consultants, with secured resources

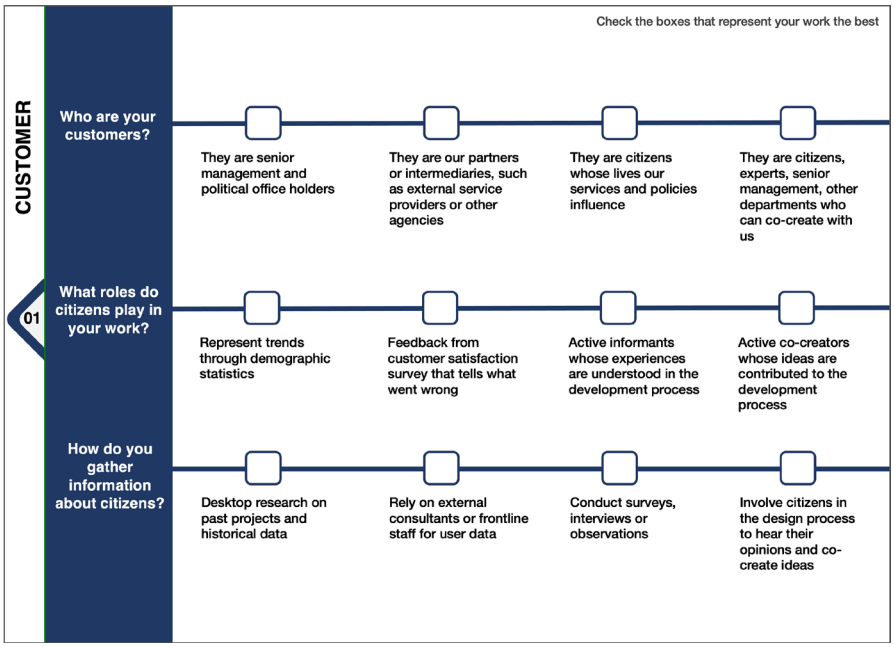

Figure 2. The snapshot of the 'customer' dimension of the Design Capability Mapping Tool.

Case 1: Workforce Ministry

The workforce ministry has a mandate over workforce and labor policies in Singapore. They partnered with global design consultancies in their early journey of adopting design and sent their officers to design training courses. In 2013, an in-house design unit was established to drive the use of design approaches and behavioral science in their work. The unit has developed the ministry's internal design framework and facilitated design training programs. The DCMT was used at the launch of a 6-month project-based training program where 34 officers from various departments participated and set their learning goals from the training program.

Case 2: Taxation Agency

The taxation agency is a leading revenue authority in the administration of business and personal taxes in Singapore. They recently developed a strategic transformation blueprint to enable an agency that caters to various taxpayers' needs. By the time of mapping, an innovation task force team was just launched. The DCMT was targeted for the 7 task force members to reflect upon their current design experiences and envision future strategies.

Case 3: Education Ministry

The education ministry looks after education policies in Singapore, overseeing the management of learning institutes from pre-schools to higher learning. Over a decade, they brought design thinking training sporadically for various departments and school teachers yet did not have an organizational-level strategic approach. A year before the design capability mapping was conducted, the ministry launched its trademarked framework for project management and tried to incorporate design within this framework. With the DCMT, they wanted to understand the current status of using design in the ministry to identify areas of improvement. 27 officers from the departments related to organization development and customer services participated in the mapping session.

Process

The mapping process in each organization started with a preliminary meeting with the representative officers, followed by the mapping workshop with all participants (Figure 3).

The preliminary meetings were organized with the representative officers from the in-house design/innovation teams (the workforce ministry and the taxation agency), and the organizational development division (the education ministry), who initiated the organization's participation in the mapping. These meetings helped the researchers clarify each organization's history of adopting design and their objectives of the design capability mapping. The representative officers also learned about how the DCMT works and what outcomes could be expected.

The actual mapping was conducted in a workshop setting. The officers from the same department sat in a group (four to seven participants in one group). Once the individual mapping was done, the officers compared their answers and discussed the reasons behind their answers (see Figure 4). In the education ministry, the representative officers requested an online version of the DCMT so that their employees could answer the questions beforehand, to reduce the overall workshop duration. The online DCMT was created accordingly. At the workshop, the education ministry officers brought along printed copies of their mapping outputs for hands-on comparison and group discussion.

The individual mapping lasted about 20 minutes, and the group discussions lasted between 90 to 120 minutes. The researchers sat together with the officers throughout the individual mapping and the group discussion to clarify the officers' questions and observe what kind of discussions unfolded. Besides the workforce ministry, all group discussions were video-recorded and transcribed verbatim for analysis. We could not obtain consent for recording from the workforce ministry; thus the researchers sat in each group to make observation notes.

Data Analysis

Data analysis in this research was twofold. The first analysis was on the individual officers' mapping outputs, by aggregating the officers' selections of each capability stage presented as an answering option to each question. This was to see each organization's overall tendency per capability topic and dimension, as overviewed in Table 3. The aggregated results for each mapping question were reported to the representatives of each organization (the initiator mentioned in Table 3) a few days after the workshop.

The second analysis focused on the officers' group discussions to investigate detailed contexts and reasons that would explain the mapping tendencies from the first analysis.

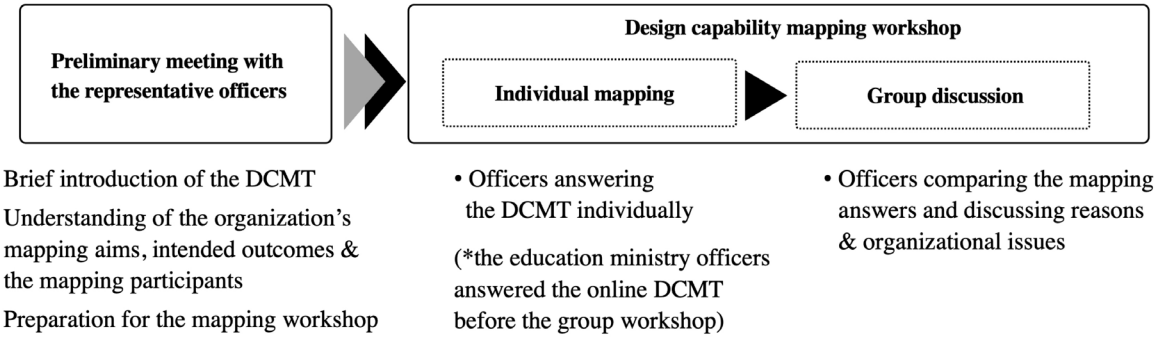

Figure 3. The mapping process with the DCMT in the case organizations.

Figure 4. Group discussions on the individual mapping outputs (left: workforce ministry, right: education ministry)**.**

Table 3. An overview of the mapping sessions at the three organizations and data sets.

	Case 1: Workforce ministry	Case 2: Taxation agency	Case 3: Education ministry
Initiator of the mapping	In-house design unit	In-house innovation task force	Senior management at the organizational development division
Aims of the mapping	As part of the design training program, to understand the officers' current status on design knowledge and to help them set learning goals	To understand the task force members' current experiences with design and develop future strategies	To understand the current status of assimilating design into their project management framework
Number of participants & job roles	34 (7 senior management level, 7 middle management level, 18 managerial level, 2 executive level) from various departments related to customer relations, workplace policy, work safety, foreign manpower management, corporate planning and management, income security policy, manpower planning, and in-house design	7 (2 senior management level, 5 managerial level) from the in-house innovation task force	27 (3 senior management level, 10 middle management level, 12 managerial level, 2 executive level) from departments related to organization development and customer services
Mapping session	Individual mapping (20 mins) & group discussion (90 mins)	Individual mapping (20 mins) & group discussion (90 mins)	Individual mapping via the online tool & group discussion (120 mins)
Data set	• 34 individual mapping outputs • Observation notes from 5 group discussions	• 7 individual mapping outputs • Transcripts & observation notes from 1 group discussion	• 27 individual mapping outputs • Transcripts & observation notes from 4 group discussions

The officers' verbal discussions while comparing their mapping outputs could reveal actual practices and employees' experiences of organizational situations. Through this analysis, we also aimed to identify what kind of learnings and reflections the employees could achieve from participating in the DCMT. A thematic analysis (Braun & Clarke, 2006) was used for the analysis of the transcribed verbal accounts from the group discussions. The first author of the paper coded all transcripts and observation notes of the ten group discussions, and the second author and another fellow researcher who facilitated the mapping sessions blind-coded twenty percent of the transcripts per organization. Then data analysis workshops were conducted where all researchers compared the codes, collectively resolved the coding discrepancies, and created a final set of themes. When creating the themes, the researchers referred to the officers' mapping choices to countercheck and validated the findings.

It was not our intention to quantitatively assess each organization's design capability based on the aggregated numbers. Instead, the main focus of the analysis was on the discovery of government employees' experiences and organizational contexts that indicate the de facto status of the organization in terms of design capability.

Findings

Overview of the Mapping Outputs

Overall the officers understood how to respond to the DCMT without much difficulty, attributed to its survey-like design that was familiar to them. They appreciated the structure of the DCMT that allowed them to figure out *"what capabilities are lacking"* and *"how we [sic] want to bring forward"* (AA_manager, taxation agency). The

varied topics and capability options enabled them to reflect on what they *"do not usually go deep enough to draw out key insights"* (JT_senior manager, education agency). A few officers associated the DCMT with the work performance review, which required the researchers to clarify the purpose of the DCMT and ensure that the individual results would not be reported to the management.

While the officers' selections of each capability stage indicate how they perceived their work and knowledge related to design, the verbal accounts from the group discussions explained the reasons and contexts of the officers' selections. We summarize each organization's overall mapping tendencies in this section and elaborate on the findings from the employees' group discussions in the subsequent sections. Table 4 overviews the three organizations' mapping tendencies for each capability topic.

Case 1: *Workforce Ministry*

As summarized in Table 4, the workforce ministry employees perceived citizens as their customers and the role of design as a tool to solve problems in a human-centered way. Despite this

Table 4. Overview of the capability tendencies of the three case organizations.

Topic	Case 1: Workforce ministry	Case 2: Taxation agency	Case 3: Education ministry
Dimension 1: Customer			
Definition of customers	Citizens *(Applied)*, but partly senior management	Citizens *(Applied)*, but partly senior management	Split views: senior management *(No conscious effort)* or citizens *(Applied)*
Roles of citizens	Citizens as active informants *(Applied)*	Citizens as demographic statistics and feedback *(Initial)*	Citizens as demographic statistics and feedback *(Initial)*
Citizen involvement	Existing data, relying on external consultants or frontline staff *(Initial)*	Existing data, relying on external consultants or frontline staff *(Initial)*	Existing data, relying on external consultants or frontline staff *(Initial)*
Dimension 2: Design Project			
Roles of design	Tools to solve problems in a human-centered way *(Initial)*	Skill to develop communication materials and improve service offerings *(No conscious effort)*	Tools to solve problems in a human-centered way *(Initial)*
Project framing	Driven by the senior management focusing on identified problems *(No conscious effort)*	Driven by the senior management focusing on identified problems *(No conscious effort)*	Driven by the senior management focusing on identified problems *(No conscious effort)*
Ideation	Ideation based on management's suggestions & conceptualizing the ideas with external consultants *(No conscious effort to Initial)*	Ideation based on management's suggestions & conceptualizing the ideas with external consultants *(No conscious effort to Initial)*	Ideation based on management's suggestions & conceptualizing the ideas with external consultants *(No conscious effort to Initial)*
Dimension 3: Implementation			
Decision making	Seek senior management's decision and select ideas that are immediately implementable *(no conscious effort)*	Review ideas with relevant teams and experts *(Initial)*	Review ideas with relevant teams and experts *(Initial)*
Prototyping and iteration	Seek feedback from relevant departments and the management, sometimes procure *(No conscious effort to Initial)*	Procure high-fidelity prototypes as project outputs *(Initial)*	Seek feedback from relevant departments and the management, sometimes procure *(No conscious effort to Initial)*
Collaboration for implementing	Monitor the implementation process and correspond regularly with implementation teams *(Initial)*	Monitor the implementation process and correspond regularly with implementation teams *(Initial)*	Monitor the implementation process and correspond regularly with implementation teams *(Initial)*
Dimension 4: Organizational structure			
Knowledge sharing	A channel to document the project and archive the cases but low participation rate *(Initial)*	Documenting project information for future reference but no systematic sharing *(No conscious effort)*	Documenting project information for future reference but no systematic sharing *(No conscious effort)*
Competence distribution	Dedicated internal team *(Applied)*	Recent set-up of a dedicated internal team, yet relying on external expertise *(Applied)*	Using external design expertise *(Initial)*
Managerial support	A strong mandate from the top management, yet lacking resource support for sustained practices *(Initial)*	Encouraged for design-driven projects with some resources *(Applied)*	Focusing on training programs, yet lacking resource support for sustained practices *(Initial)*

awareness, they had little citizen involvement in their work and their design projects were driven by the senior management. While the management encourages the more use of design approaches, the employees' current work processes and organizational structure were not apt for them to apply design approaches.

Senior Management as a Double-Edged Sword: A Champion and a Barrier

The mapping outputs showed that the senior management was key stakeholders for the officers' decision-making, such as project aims identification and idea selection. In fact, some of the employees indicated the senior management as their customer. With the management's mandate on design adoption, design-related projects had a direct reporting structure to the senior management to speed up the project initiation and implementation. Ironically, such influences seemed to impede the officers' autonomy and motivation to experiment with design. Although they collected user insights, the middle management *felt stuck* (JJ_manager, workforce ministry) between the senior management's expectations and user needs and ended up trying to find the evidence to support what their *boss* said. While the officers considered it useful to prototype ideas, they were concerned about reporting an experiment failure to the senior management.

Citizen Involvement Means the Slow Process

The officers who had participated in the design training workshops had an awareness of the importance of citizen involvement yet were experiencing a lack of a supportive environment and resources for citizen involvement. As a result, the employees remained in the status-quo work style, by relying on churn data or following so-called best practices from the overseas instead of citizen involvement. Design approaches were perceived as extra or special activities, not being assimilated into the officers' day-to-day work. For example, user research and prototype testing appeared as a barrier for their *hurried work* (MT_manager, workforce ministry) that needs to produce *immediate gains.*

Ineffective Communication of the Internal Design Framework

Although the design unit developed the ministry's internal design framework three years before the DCMT workshop, the officers showed a low awareness of the internal design framework. Most officers said they only learned about the framework during the workshop. This was a striking finding for the design unit members as their main responsibility was to facilitate the diffusion of design organization-wide. This finding indicates the need of more effective strategies for knowledge diffusion, going beyond their current practices of project archiving and presentations.

Case 2: *Taxation Agency*

The taxation agency had recently set up the innovation task force with some resource support. While the task force members were tasked to perform as design champions of the agency, they were unfamiliar with citizen involvement and design values. The group discussions revealed their skepticism about design approaches in terms of credibility and the misalignment of their visions for the design capability development.

Citizen Involvement Impedes the Zero-Error Image

The mapping outputs in the taxation agency showed their strong reliance on statistical data as the reliable representation of demographic segmentation. As the group discussion revealed, this reliance was attributed to the taxation agency's strong emphasis on credibility. The task force members shared their concern about misrepresenting the agency's ability when contacting citizens for feedback and ideation. They also felt reluctant to introduce incomplete prototypes to their citizens, as that would project a failure image.

> When it comes to taxpayers, mostly, we would rely on data which is historical, because I think our area of work is quite sensitive. We sometimes do have a reservation about going to speak with taxpayers on these matters. I would say we are quite reliant on historical data like taxpayers' surveys or after-call surveys. (HY_manager, taxation agency).

> We do not need to talk to people regularly as that would suggest some problem [to citizens]. Testing them out, fail early, fail-safe is also a mindset we have challenged because traditionally failure [*sic*] is bad. The word spooks people big time. When we introduce this idea that it is ok to fail because there is a lot to learn from failing early, people just not warm up to that. (SM_director, taxation agency).

Their lack of experience with actual design projects, thus lacking knowledge on how to present themselves and interact with users, might have contributed to this conception, too, which will be described in the following subsection.

Design Champion's Skepticism to Design Approaches

During the group discussion, the task force members expressed their uncertainties with design methods that collect qualitative data out of a relatively small sample of users that contain emotions.

> I think design brings out the emotions a lot, the empathy part. We do like hard data and analysis, we do not look at their feelings, even though someone might say they are happy. They are digits after all. (HY_manager, taxation agency).

They were also uncertain with how to translate user research findings to innovative solutions. Without such experience and knowledge, user research findings gathered from their previous design projects seemed less valuable to them.

> We have committed almost four months of our lives… much money…The findings and the research I hear from the people involved in the projects that it validates what they already know. We choose those verbatims that support what we want to push, so then there is no earth breaking insights. I have not seen that big value from design that would be worth that investments so far. (AA_director, taxation agency).

By experiencing the gap between their work and their approaches, they were discussing the need to develop a measurement framework of design projects, to ensure benefits from design approaches.

> We always talk about outcome-based work, so I also scratch my head how we measure the success of the proliferation of design thinking or rather design as a mindset tool. How to deliver business results because if we try to do things differently, and we measure using the same old metric, they will be counter-productive. (HY_ manager, taxation agency).

Misalignment in Future Visions and Vocabularies

The task force members identified discrepancies among their visions on the agency's design capability development, whether "the whole of the agency must attend at least one design program" (AA_director, taxation agency) or "not all of [the employees] should have design knowledge" (SM_director, taxation agency). Realization of this misalignment was critical to them as they were tasked to build design capability-related strategies of the whole agency. This reflection led them to address the importance of aligning their views on future strategies, as well as establishing common vocabularies as a fundamental level of design capability.

> From the capability mapping, we can tell that all of us have different ideas of where we think we want the agency to be in the next five or ten years, how design plays a role. I think that is something we will need to figure out. (AA_director, taxation agency).

> We need to have that common vocabulary… It is quite a lot to ask for all divisions, but I think it is imperative to have that vocabulary for the agency to provide good service. (DJ_manager, taxation agency)

Case 3: *Education Ministry*

The education ministry officers perceived design as a set of tools to solve problems in a human-centered way. However, they rarely used design approaches for problem solving. Comparing to the other two case organizations, the education ministry did not have a dedicated in-house design/innovation team nor internal design framework. The group discussions revealed the employees' fatigue to multiple innovation approaches that the ministry was concurrently adopting.

Misalignment in Customer Definitions

One of the salient findings from the education ministry was the officers' split views on how they defined their customers. The ministry being a multi-organizational entity that involved a broad coverage of stakeholders, including schools in various tiers, seemed to be the cause of this misalignment. Even within the same department, whom the individual officers' work aimed to serve determined their differing perceptions on customers. For example, a manager from the public service administration team referred to the senior management and headquarter staff as their "direct customers to convince and get their buy-in" (SP_manager, education ministry). However, for the frontline officers from the same team, their customers were citizens, usually students' parents. The identification of such differing perceptions evoked their discussions on the need for alignment. While some found it *fascinating* to realize the need to *focus*, some did not see the need for alignment. The two following snippets demonstrate each view.

> It is fascinating because we all need to unpack the word; you see we all have different understandings [*sic*]. So, the results and perceptions are not consistent also…I thought we should focus. (JT_ senior manager, education ministry).

> About having a common language across different divisions, it will be great if we can achieve that. I think currently, different divisions operate differently. Some do not see a need to, and some see a need. We have all these different divisions then you have the whole of civil service where you have different ministries. What is the point of having alignments given within the ministries? (PN_ manager, education ministry).

Partial Understanding of Design Contribution Areas

Most of the participants from the education ministry attended at least one design training session, mainly short-term design thinking workshops, but they rarely used design approaches after the training. The group discussions revealed that the officers found design approaches not suitable for their day-to-day work that was larger and more complex than what they believed design could tackle.

> In our work, it is tough to do that. It is vast, it is not like designing products kind of thing…By and large it is hard to look at. (KW_ deputy director, education ministry).

> I know about observations, I know co-creation, I know all, but do I do it? Maybe I do not…my view is we cannot do that in the project. (JT_senior manager, education ministry).

This might indicate a gap in the ministry's current design training programs, which could not demonstrate design contribution areas holistically and adequately. Some mentioned the limitations and irrelevance of the training materials to be applied to their work. This experience resulted in the officers' skewed view on their own design competence, or partial understanding of design contribution areas, in that they believed they knew design methods without being exposed to the full potentials of design.

Fatigue and Confusion from Multiple Innovation Approaches

The education ministry has adopted various innovation approaches for years, which resulted in the legacies of multiple frameworks entrenched within the ministry. The officers seemed to be often left perplexed. One of the senior management's recent attempts was to align those different approaches along the new project management framework developed by the ministry. Yet they have faced challenges in aligning design with the project management framework.

> It [design] is deeper than the general [project management framework–the process name anonymized]. When understanding stakeholders, the context is like what are the general needs, and that kind of thing. We do not go so deep with [project management framework]. So at the end we just look at best practices. (KW_ deputy director, education ministry).

As such, the officers were not clear with the management's intention or vision behind those approaches as shared by one manager:

> Currently the ministry's support seems to focus more on training programs than actual practices. (JT_manager, education ministry).

Towards Future Strategies based on Interrelations of Design Capability Layers

The findings from each organization's DCMT results showed how the status of different capability layers influences each other and determines the overall design capability of the organization (Figure 5).

In the workforce ministry, although the ministry had started to adopt design approaches many years ago, the *design resources* were still centralized within the in-house design team and other employees lacked opportunities and motivations to apply design (*design resources*). The reason can be found from other layers of design capability: while the design adoption was mandated from the senior management, the management themselves did not have proper knowledge on what it takes to create successful design projects (*design awareness*), and there was a lack of *organizational structure* that ensures adequate resource support and work processes for employees' autonomy. In addition, the current knowledge sharing practices were not effective enough to transfer design knowledge initiated from the in-house design team to other departments (*organizational structure*), thus the employees were not aware of the ministry's internal design framework and design cases (*design awareness*).

The workforce ministry is one of the first public organizations in Singapore that adopted design, and their in-house design team established about 10 years ago has been benchmarked by other organizations in Singapore. It was striking for the inhouse design team to find out that their internal design framework and design projects were not effectively populated organization-wide. This finding indicates that although design resources were acquired in the organization, design capability development gets stagnant without adequate awareness from the decision-makers and knowledge dissemination platforms. For the sustained design capability in the workforce ministry, the senior management's design awareness on what it takes to assimilate design approaches into the employees' day-to-day work should be the key development area to support employees' practice and motivation to use design. More effective knowledge dissemination from the in-house design team to other departments should be another key development area.

In the taxation agency, the lack of *design resource*s was inevitable as they had just started to adopt design approaches. What appeared more critical was the lack of *design awareness* among the employees, i.e., the task force members' misaligned understandings of design contributions and their skepticism to design approaches. The task force members were also experiencing conflicts from the design approaches against their organizational values (*organizational structure*).

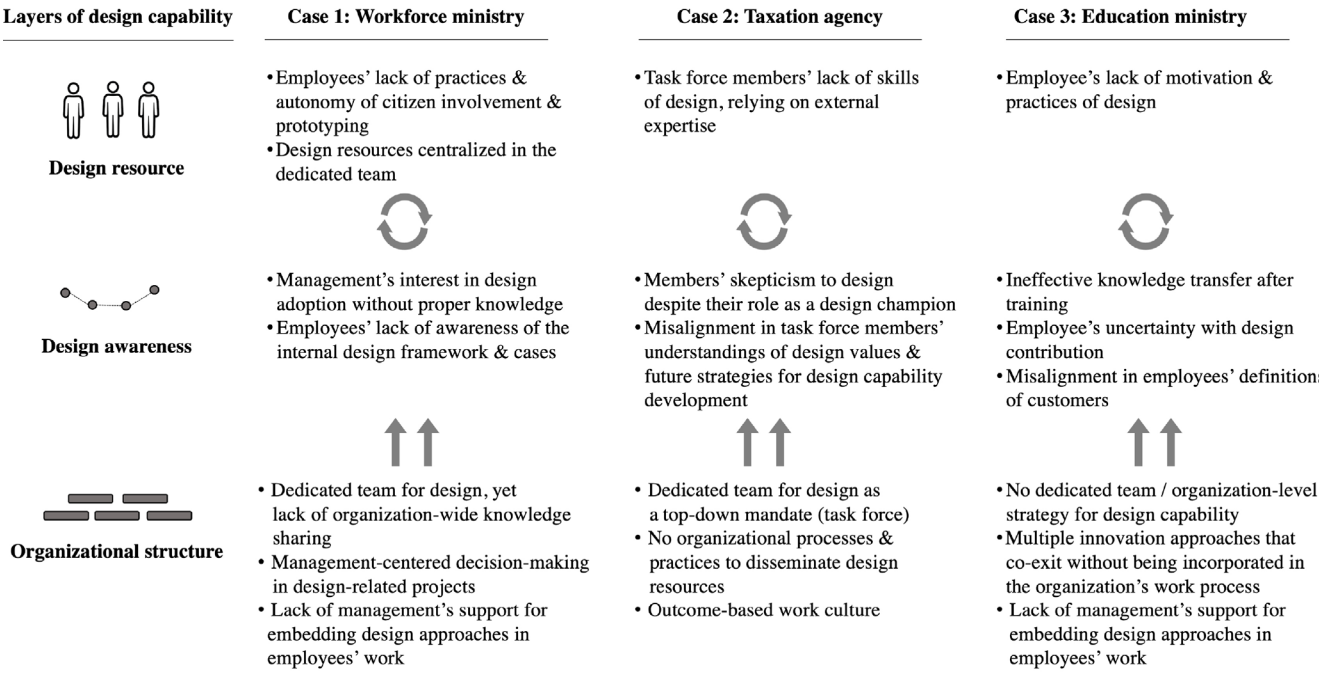

Figure 5. Key findings from the DCMT mapped upon the three layers of design capability.

Comparing to the other two ministries, the taxation agency showed a higher degree of skepticism to design approaches. While the other two ministries had had various direct interaction channels with different groups of citizens (e.g., various customer centers for migrant workers and employers, and schools for parents and students) even before adopting design, the taxation agency was inexperienced with direct interactions with citizens and even considered that interaction with citizens may imply the agency have *problems*. The taxation agency's services focus on efficient and precise transactions, rather than attending various experiences of different citizen groups. Because of their lack of experience and unfamiliarity to design, the taxation agency has been trying to learn from overseas cases, such as the Australian taxation office (Body, 2008). For the taxation agency, the task force members' mindsets and awareness of design should be the key improvement areas, so that they can lead the development of organizational strategies for the agency's design capability. They need to develop more first-hand experiences of design-related projects and attain more design resources (e.g., internal designers) to increase familiarity and expertise with design approaches and accumulate successful cases. For an effective assimilation of design in their work culture, a development of a measurement framework of design should be considered.

In the education ministry, the absence of systematic strategies for design capability development (*organizational structure*) led to the employees' sporadic exposure to design training programs, resulting in their partial, or skewed, understanding of design contribution (*design awareness*). Multiple innovation approaches without being incorporated into the ministry's work processes (*organizational structure*) also added to the employee's confusion with design (*design awareness*). Such non-established structure and awareness, in turn, shaped a low level of design competence (*design resources*).

While the workforce ministry and the taxation agency had an internal design team or a task force who try to promote design approaches and develop them into internal processes, the introduction of design knowledge and skills in the education ministry has been an ad hoc task of either the customer service team or organization development team. This might have resulted in the misalignment of definitions of customers and lack of motivation to use design even after the design training. For effective and sustained development of design capability in the education ministry, the management could consider developing more defined strategies and a dedicated task force to establish the roles of design and processes in the ministry. Instead of short-term training, a longer-term project-based training might help the employees experience the relevance of design methods in their work.

Discussion and Conclusion

The above-presented findings from the DCMT demonstrate what kinds of new learning the DCMT could provide for government organizations. In this section, we firstly discuss the implications of the DCMT findings for sustained design capability and then the benefits of the DCMT distinguished from existing design capability frameworks, as well as limitations and future development needs.

Towards Sustained Design Capability

The DCMT findings from the three government organizations highlight what needs to be considered for sustained design capability in government. Regarding the misalignment of the employees' understandings of design and customers, while such misalignment might be inevitable due to their differing job roles, the ignorance of the misalignment could be critically problematic as it might result in frictions in design-driven projects (Sangiorgi et al., 2016). As Bason (2010) emphasized, for design-led innovation to be integral to the organizational hierarchy, constant conversations across various corporate functions to identify and reconcile misalignments are required. The importance of a shared vocabulary was recognized by the employees themselves during the discussion about the misalignments. A common, shared design vocabulary would be a fundamental ground for sustained design capability (Bailey, 2012).

The findings also highlighted the need for the leadership that has an adequate understanding of design. Otherwise, the consequences would be an overall lack of engagement, unrealistic expectations on the expected *return on investment*, and a narrow perspective on design (Mintrom & Luetjens, 2016; Clarke & Craft, 2018), which were clearly shown from the DCMT findings. The management who initiated the design adoption turned out to be in fact *design pushers* (Turner, 2013) in our case studies, whereas they believed they championed design in their organizations.

Another critical finding was the government employees' feeling of insecurity about citizen involvement and conflict with the zero-error image that they wanted to portray to citizens. Many pieces of literature on the public sector design highlighted design as a strategic disruption to the government's system-centered, expert-oriented, and non-risk-taking work culture through citizen involvement, co-creation, and experimentation (Bason, 2010; Kimbell, 2015). While government organizations benefited from these aspects of design in some parts of their work, their public communication to be credible, accountable, and stable is their prime concern (Clarke & Craft, 2018). While this finding, as we speculated, might be more saliently highlighted in the Singapore government, where citizens have relatively high trust in its paternalistic governance (Quah, 2013), similar observations have been reported in other parts of the world (e.g., Hyvärinen et al., 2015; Clarke & Craft, 2018). There is a call to clarify the government employees' perceptions of design, conflicting with their value systems.

Benefits from Employee-Participatory Mapping

A strength of our approach was that the DCMT provided an avenue for the government employees to map their own experiences and build collective reflection. The employee-participatory mapping enabled to manifest the government employees' experiences of the managerial mandate and support, their mindsets and perceptions of design methods against their existing work processes, and the misalignments in their understandings of design values, customers, and future visions, which were highlighted in the previous section. This approach was different from existing studies that often involved external consultants or researchers to come and investigate and

reported the analysis results to the management (e.g., Björklund et al., 2018; De Paula et al., 2018; Heskett & Liu, 2012; Storvang et al., 2014). The roles of employees in those studies were limited as data points to inform the management, and the support for employees' reflection and learning was not addressed.

Lin (2014) claimed that elevating design capability in the policy context requires changing the mindsets and mapping out the implicit and explicit goals and processes, which require individual reflections. While many government organizations start to adopt design approaches as a top-down mandate (McGann et al., 2021), how the employees experience the mandate and whether the management provides adequate support should be continuously assessed. The DCMT, we believe, contributes an instrument to disclose the employees' de facto work conditions and structural barriers by engaging them to map their own experiences and facilitating collective reflection, otherwise hard to reveal. The DCMT, in this sense, upholds Sangiorgi and Junginger's (2015) argument that employee's reflection as a knowledge management technique has an essential role in proliferating design in the organization.

Benefits as a Holistic and Practical Assessment Tool

The twelve mapping topics under the four dimensions, and the four capability stages for each topic, constructed the holistic contents that encompass multiple layers of design capability from the individual and to organizational level. As a result, the findings from the DCMT covered the three layers of design capability, i.e., individual design resources, design awareness, and organizational structure. The findings also described how the current status of each capability layer influences the other layers within each organization. As we demonstrated above, the identification of such interrelations helped to address the development areas that would result in a bigger and more sustainable impact.

The construct of the DCMT in the survey format with multiple-choice options, also made it directly applicable to the government employees. It enabled to generate the practical assessment of various aspects of design capability, as well as actionable strategies, informed by the more advanced stages presented as mapping options. While the existing design capability/maturity frameworks for governments introduce high-level taxonomies on focused topics, such as the roles of design (Design Council, 2013), citizen engagement and co-creation (Junginger, 2015), and the design knowledge absorption (Malmberg, 2017), the DCMT provides a holistic yet practical assessment tool that government employees can go through. The group discussions to be built upon the DCMT outputs add to the holistic assessment as they address contextual factors, such as employee experiences and organizational situations. As such, the entire procedure of the DCMT could bridge a gap addressed by Storvang et al. (2014) in that their models could not fully reflect organization's situations and practices around design capability that are far more complex.

Potential as a Knowledge Transfer Evaluation Tool

Existing design training programs have paid little attention to how the newly obtained knowledge is integrated and used in the organization, and the government organizations are often left without strategies or tools to evaluate the knowledge transfer (Malmberg & Holmlid, 2018; Malmberg & Wetter-Edman, 2016). Our findings highlighted that the DCMT could serve as an instrument to trace what knowledge has been transferred and applied to the officer's work after the training. The DCMT can be applied before and after the training for a more tangible assessment of the learning. Before the training, going through multiple questions of the DCMT could help the employees set their learning goals, as those questions holistically address various capability topics under the four dimensions and the different capability stages hint at alternative practices. After the training, the employees could revisit the DCMT to see whether they have achieved their learning goals. The DCMT, in this sense, could support officers' goal-based scenario learning (Schank, 1996). The mapping outputs could help the management understand the effectiveness of a particular training program or their overall capability-building strategy.

Limitations and Future Studies

It is important to note that, in the context of government organizations, the advancement of design activities may not necessarily indicate the advancement of design capability. The level and form of design capability efficacious to each organization would depend on its policy and governance context, in junction with its other methods and future visions for innovation (Clarke & Craft, 2018). In this light, the DCMT should be understood as a *conversational piece* (Junginger, 2015) for employees to discuss and identify the right form and level of design capability for their teams and organizations, instead of a normative index where all organizations need to work towards the most advanced practices.

Not discussed in this paper is how the findings from the DCMT can be shared with the senior management for strategic considerations. While the present study with the DCMT focused on facilitating the employees' reflection through individual mapping and group discussion, the management's strategic consideration should be included for capability development (Terrey, 2012). Future work should investigate the management's interpretations of the mapping outcomes and consider including the management's reflection on the employees' mapping outputs or co-reflection as part of the mapping activities. In addition, while the current study deliberately focused on qualitative data from the group discussions, how to systematically quantify the mapping choices and visualize the quantitative results could be explored in future works.

As the three organizations in this study are all from Singapore, this study did not explicitly discuss possible cultural factors that would influence the government organizations' design capability. Future studies might investigate overseas cases, compare the findings from the Singapore governments, and elaborate on how governments are developing design capability in cultural, social and organizational contexts, to better attend to broader and deeper social structures (Vink & Koskela-Huotari, 2021) as the future development areas.

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