

# Implementation of human-centred design in Policymaking: Bibliometric analysis and systematic review

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## ABSTRACT

Government and policy academics are increasingly adopting human-centric design (HCD) in policymaking to deal with increasingly complex societal challenges. However, current research is mainly concerned with the potential implication of design or design thinking approaches in public policy rather than focusing on how a specific human-centred design (HCD) tool can be used in policymaking. Although “design” and “human-centred design” are often used interchangeably in studies on policy design, it is important to make a clear distinction between these two concepts to employ appropriate methods when delivering public policies and services. HCD is a design approach which highlights the effects of the design on other stakeholders rather than those traditionally regarded as users. This paper aims to develop an understanding of (1) how the HCD concept has been used in policy research; (2) how HCD techniques have been used in policymaking, (3) the obstacles that civil servants and policymakers encounter when adopting HCD and viable strategies to overcome these challenges. These objectives were accomplished by using bibliometric analysis and systematic review. The research findings indicate that HCD techniques are used in formulating and executing policymaking. However, there are three key limitations to applying HCD in policymaking, namely inclusion, alignment with the current policy system and the risk of oversimplification. Successfully addressing these obstacles will facilitate the advancement and execution of HCD in policymaking.

## KEYWORDS

Human-centred design, policymaking, systematic review, keyword co-occurrence, word cloud

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## 1 INTRODUCTION

### 1.1 Limitations of conventional policymaking approach.

Policy is inherently driven to meet the needs of citizens. Through policy design and implementation, humans are therefore at the heart of the policy process, and policymakers must prioritise core human values [1]. The policy process tends to involve multiple stakeholders with diverse aspirations, interests and viewpoints which exacerbates the ‘wicked’ nature of policy problems [2] and may be regarded as a principal cause of policy failure [3]. A resolution that favours a certain group may result in a concomitant escalation of problems for other communities [4]. Additionally, social reality is in a continual state of change, resulting in a confluence of multiple rationalities that must be handled simultaneously [5] and requiring more flexible and adaptable interventions [6]. This complexity requires us to reconsider our approach to policy problems to deal with the increasingly complex societal challenges [7].

Simultaneously, citizens have high expectations in terms of government and public service performance [8], [9]. Furthermore, people are not homogeneous due to the influence of their social background, cultural upbringing, and geographical context [10]. Consequently, a core challenge in policymaking is to effectively address the diverse needs and expectations of the population. Policy failure may also be attributed to the populace’s incapability to comprehend or accept the rational intentions of the policy [[6]. Dissatisfaction with public services arises and people’s trust in government decreases when the government fails to meet citizens’ expectations [11], [12]. Government leaders, policymakers and lawmakers are actively looking at novel approaches to enhance the quality of the policies and laws that better meet the public’s demand and refine the delivery of public services [13].

### 1.2 The motivation for applying human-centred design in policymaking

The driving force behind HCD was the development of technology-driven solutions that were inadequate and incompatible with the requirements and desires of users. In the same way, policy failure can be seen as a result of similar limitations in comprehending the fundamental nature of issues and the appropriate solutions. The connections between policy design and social expectations could be examined through the lens of public value, a framework by Moore [14]. The design concept in policymaking is relevant because of the

common goal of attaining substantial advancement in society and the necessity to address complex policy problems where design is considered a solution. Design challenges traditional policymaking approaches by promoting evidence-based policymaking and a systematic process of researching, designing, testing and building [15]. By drawing the principles of design into the policy process there is the potential to blend focus and flexibility. In other words, design enables policymakers to focus on the policy context and the practical implications of design, whilst also exploring the repercussions that might arise from policy implementation. Furthermore, design inherently incorporates implementation considerations and systemic ramifications into the planning and development processes, so that policymakers can focus on society's resources while addressing relationships and interactions between the government, citizens and other societal actors [6]. This shifts the policymakers' focus from "being problem-centred to being human-centred", which allows them to utilise the information and understanding acquired from human experiences to develop insightful and effective inquiries while addressing complex and demanding matters in policymaking [16, p. 58].

The design-based or "design thinking" approaches in policy and governance have garnered significant attention in recent years [17], [18]. One indication of design-centric policymaking is the discernible rise in the number of policy labs in the UK in recent years, reflecting the government's growing need to incorporate design science in policymaking [19], together with a general uptick in broad academic interest in user-centred approaches beyond its traditional areas of application [20].

### 1.3 "Design" versus "Human-centred design"

Although "design" and "human-centred design" are often used interchangeably in most studies on policy design, it is important to make a clear distinction between these two concepts to employ appropriate methods when delivering public policies and services. According to Giacomini [21], human-centred design (HCD) is one of three major design paradigms characterised by specific discourses and values. These three paradigms are technology-driven design, sustainable design and human-centred design which usually result in noticeable distinctions in the products, systems or services they produce, even when operating within the same legal, regulatory, cultural and economic constraints [21]. Hermus and colleagues [22, p. 13] introduced multiple design types by distinguishing between approaches that emphasize the content of design (how knowledge is used), the context of design (The circumstances in which it is applied) and the design impact (cognitive or practical changes it brings out). From this discussion, human-centred is a type of design.

Derived from an approach centred on ergonomics and anthropometric data [23], HCD is defined as "an approach to systems design and development that aims to make interactive systems more usable by focusing on the use of the system and applying human factors/ergonomics and usability knowledge and techniques". In practical use, "human-centred design" and "user-centred design" can sometimes be used synonymously. However, the use of "human-centred design" highlights the effects of the design on other stakeholders rather than those traditionally regarded as users [24, p. 2]. HCD is a group of methods that primarily involve utilising

knowledge about human beings to create products and services that effectively address their desires and needs [25]. HCD focuses on fundamental aspects of human existence, such as human rights and human dignity [26]. In the context of human-centred design, objects, interactions, and systems serve as intermediaries that develop connections with people and influence how people engage with others [16].

Initially, HCD became popular in the business sector, specifically focusing on commercial physical products and services. It utilises qualitative research methods commonly used in social science including ethnography, contextual inquiry and focused observations and interviews to gain a deep understanding of people and their interaction with environments, processes, and systems. Quantitative data reveals the "what" of human behaviour, whereas qualitative research offers an understanding of the "why" behind human actions. The combination enables policymakers to gain insights from several perspectives of the complex system [27].

### 1.4 Research gap and research objectives

Recognition of the potential of HCD in public administration is emerging [22]. A considerable amount of literature has been published regarding the applicability of design in public policy problems [28]. Nevertheless, the various design-related concepts, such as design thinking, policy design, designing, and HCD have not been well defined and are often used interchangeably. Current research is mainly concerned with the potential implication of design approaches in public policy, rather than discussing a specific design technique. Few writers have been able to draw on any comprehensive research that specifically identifies the HCD methods that have been utilised, and the barriers and difficulties encountered during their implementation, and explore the potential strategies to address these challenges. The main objectives of this study are to develop an understanding of (1) the HCD concept and its connection with policy research; (2) how HCD techniques have been used in policymaking, (3) the obstacles that civil servants and policymakers encounter when adopting HCD and viable strategies to overcome these challenges. These goals were accomplished by using bibliometric analysis and systematic review.

## 2 RESEARCH METHODOLOGIES

### 2.1 Keyword analysis

Prior to conducting the systematic review of the implications of HCD in policymaking, a comprehensive keyword analysis was conducted, which shows the potential linkage between two concepts "human-centred design OR user-centred design" and "policymaking". The searches were initially conducted in Web of Science (WOS). The WOS has been extensively employed by bibliometric researchers to investigate the evolution of scientific knowledge in a range of disciplines [29], [30].

**2.1.1 World clouds.** Word clouds have become a popular and visually intuitive way to visualise text content based on the phrases that occur most frequently [31]. It enables viewers to make an initial survey of relationships and patterns within the corpus [32].

A search was conducted on WOS to retrieve published articles, conference proceedings and Book chapters written in English with

“human-centred design” in their title, abstract or keywords. The data is exported to Excel files in the xls format and subsequently manipulated using Python Programming Language. A similar process is applied for articles searched from the term “policymaking”.

The text used to create the word cloud was generated from the articles’ titles, abstracts and author keywords. The text was processed using ‘nltk’ package, a Natural Language Processing library for Python. After using tokenisation to divide the lengthy titles and abstracts into individual words, all English stop words, numbers and special characters that do not contribute to expressing the concepts were eliminated. Subsequently, the lemmatisation technique was employed to transform various word forms (such as plural nouns to singular nouns) to minimise repetition and highlight the most significant terms, ensuring an accurate representation of their frequency. In addition, the common groups of two or three adjacent words, known as bigrams and trigrams, which occurred frequently in the title and abstract, were treated as single words. The authors’ keywords are maintained. Then, the word clouds were generated for each set of cleaned text data.

**2.1.2 Keyword co-currency analysis.** The methodologies for bibliometric analysis can be classified into two groups: performance analysis and science mapping. Fundamentally, performance analysis primarily considers the contributions made by each constituent, whereas science mapping examines the interrelationships among research constituents [33], [34]. In this paper, the bibliometric analysis reveals the correlation between the two study subjects: policymaking and human-centred design.

Keyword co-occurrence is a science mapping technique that aims to comprehend the knowledge elements and structure of a scientific or technical topic by analysing the connections between keywords in the literature. In a keyword co-occurrence network, each keyword is considered a node and each occurrence between two words serves as a link connecting those two keywords. A high frequency of co-occurrence illustrates a strong correlation between two words [35].

In this study, the data for keyword co-occurrence is generated by merging two datasets utilised in creating the word cloud. Python is used to process the data. After importing and combining two datasets into the programming environment, the researcher removed the replicated articles in the merged dataset. Subsequently, the author’s keywords were cleaned and standardised. All terms were transformed to lowercase to guarantee case insensitivity in the analysis (for example, “Policymaking” was converted to “policymaking”). Hyphens, commonly used for word connection were substituted with spaces. In addition, specific cases of regional spelling variations or interchangeable phrases will be adjusted to be consistent with normal British spelling (for instance, “centered” and “centred”). The process of cleaning and standardising the data helps to reduce noise and avoid the fragmentation of similar concepts. Then, the cleaned dataset was exported as a CSV file for analysis using VOS Viewer, a software application for generating and exploring maps derived from network data [36]. In addition to mapping the structure of the expertise domain labels to present the associations between keywords that reveal the underlying composition or structure of the topic, the tool also clusters the keywords and presents them using different colours [37].

## 2.2 Systematic review

The keyword co-occurrence analysis allows the quantitative mapping of study topics at a macro level, which shows how the research topic has changed over time and how key concepts are connected. On the other hand, a systematic literature review specifically examines the detailed outcomes and methods employed in individual studies. The insights derived from keyword co-occurrence can support traditional systematic review [35].

**2.2.1 Information sources and search strategy.** The publications were searched from the three main databases from the date of inception until April 2024 using search terms as follows:

*‘user-centred design’ OR ‘human-centred design’ (topic) and ‘policy’ (topic)*

In this study, the preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) process was used to filter, screen, and select the articles. Searches were performed in the primary databases: WOS, Scopus and ProQuest. The search identified publications with the search terms as topics. This search was limited to review articles, early access papers, conference proceedings and book chapters. An ad-hoc search on the internet and Google Scholar was also conducted to discover government and technical reports.

**2.2.2 Study selection.** Selected papers must satisfy at least one of the following criteria: (1) the main objective is to explore the utilisation of HCD in policy and public sectors, including its values, benefits, and the factors that facilitate or hinder its implementation in these sectors; (2) the paper would present one or multiple case studies to illustrate the practical application of human-centred design in a policy context.

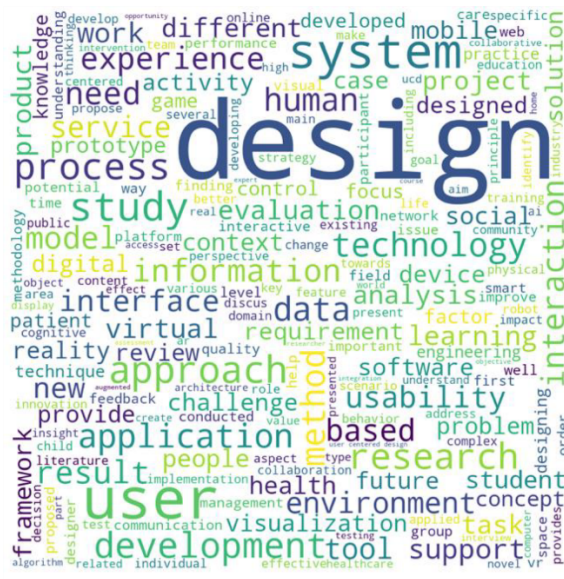
The papers were excluded from the research for the following reasons: (1) they were not relevant to the use of human-centred design among civil services and government policymaking; (2) they focused on the policy analysis result rather than policymaking, (3) they did not discuss the aspects of interest related to government policy, or (4) they only contained abstract.

From 1306 articles were searched from the database, following the procedure of identification, screening, and publication selection utilising PRISMA, 52 papers were included and reviewed thoroughly.

## 3 RESEARCH RESULTS

### 3.1 The connection between HCD and “Policymaking” from keyword analysis

**3.1.1 Word cloud.** These two word-clouds (Figure 1) display the most commonly used keywords in studies on human-centred design and policymaking. The word cloud (1) generated from 9,303 publications in the WOS database, focusing on the topic of “human-centred design” or “user-centred design”, reveals that the most commonly used concepts are design, user and system. The research papers examined several facets of design, encompassing system design, product design and software design. This also emphasises the user-centric methodologies that are grounded in a deep understanding of the user’s experience using data. These design applications were



**Figure 1: Word cloud created using title, abstract and keyword of research on (1) "human-centred design" topic (the left word cloud) and (2) policymaking (the right word cloud)**



mostly adopted in the field of digital solutions, healthcare and other complex challenges such as education, and public service.

There is a considerable number of studies on policymaking with 57,779 papers found from the search. The word cloud (2) encompassed a broad examination of public policy across various domains, including education, technology, health, climate change, and other global and international challenges. Several keywords continue to hold dominance in this subject, including “process, system and development”. Furthermore, the significance of the decision-making process within the realm of policy and governance is emphasised. The frequency of “information, data, analysis” suggests the reliance on data-driven, evidence-based, and analytical approaches to policy study.

**3.1.2 Keyword co-occurrence.** To conduct the keyword co-occurrence and examine the interconnections across the two research topics, the two bibliometric databases used to create word clouds were combined and, 574 keywords were found that match the criteria of appearing in the bibliometric data at least 40 times. These keywords were divided into six clusters (Figure 2), each distinguished by a unique hue in the keyword co-occurrence map. The frequency of the keyword increases proportionally with the size of the circle [37]. The size also indicates the competence of the keyword and indicates the main theme of the cluster to which the keyword belongs.

The purple cluster consists of 17 keywords, which are slightly isolated from other clusters. The theme of this cluster is related to the computing domain (such as human-computer interaction, and virtual reality). It is directly connected to HCD (yellow cluster). This aligns with the fact that HCD has been used in the creation of computer and digital products.

Other clusters are situated close to each other. The green signifies data science algorithms such as machine learning, deep learning and

reinforcement learning. The red cluster is the biggest cluster with 212 keywords which encompasses policy and social problems such as sustainability, renewable energy, political issues and economics. The dark blue pertains to public health, which has become a separate and identifiable group in this bibliometric database because of the recent disruption Covid 19. Additionally, a small group of light blue dots shows the research methodologies such as content analysis and systematic review.

This keyword co-occurrence analysis result indicates that researchers are using data and HCD methods to influence policy in the development and healthcare sectors by employing various research methodologies. More generally, it appears interest in HCD from the policy side is largely mediated by a primary interest in data exploration (i.e., note green clusters mediate connections between yellow UCD and red policy-making cluster).

### 3.2 Systematic review

The systematic literature review delves into the specific content of selected publications in detail to achieve the study objectives. These selected articles primarily discuss how HCD has been/would be used in Government Policymaking. Among selected publications, there are two main types of research. The first category involves discussing a case study of applying the HCD tool in a policy project. The second category involves a general discussion of the trend in policymaking towards user-centred design and the advantages of HCD/ UCD in policymaking then giving recommendations.

**3.2.1 HCD methods currently used in policymaking.** A range of HCD tools have been employed in policy (Table 1). HCD revolutionizes policymaking prioritizing the inclusion of actual individuals to effectively address their needs [27]. By observing individuals' behaviour within the community, policymakers can perceive the expression of similar behaviours inside themselves, facilitating the



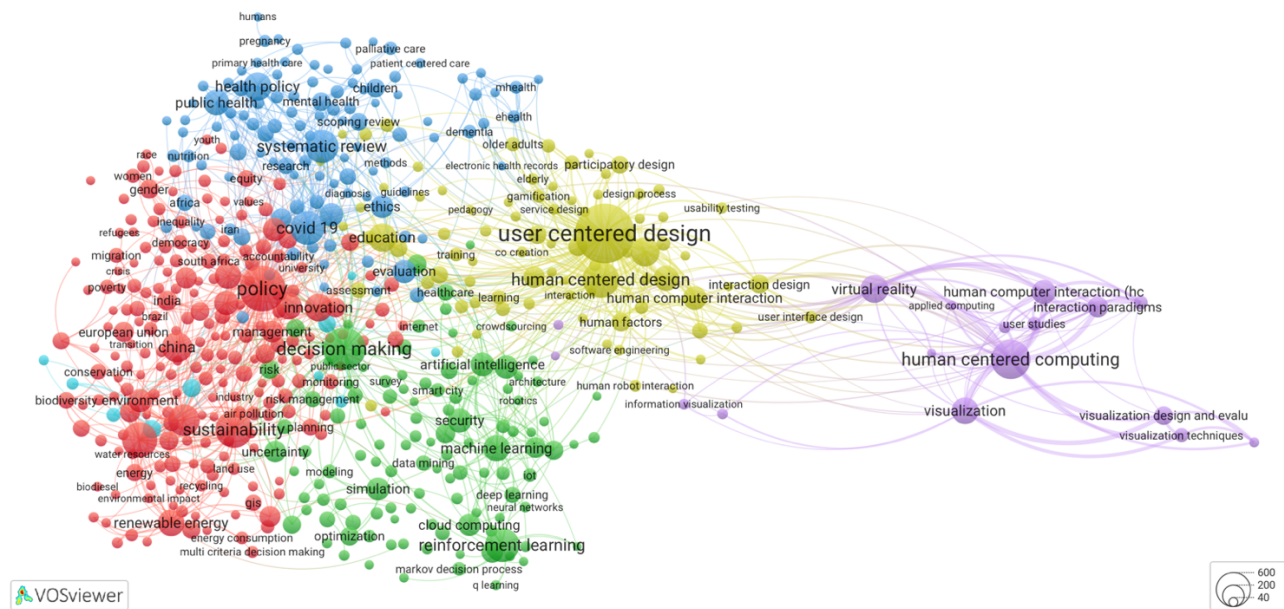


Figure 2: Keyword co-occurrence map

Table 1: HCD methods used in Policymaking

HCD methods	Description	Application sector	Sources
Policy labs	Governments promote the stakeholders engagement to promote policy co-design	Government	[41] [42]
Design thinking/ Empathy mapping	Empathy mapping focuses on understanding behavioural reactions, could replace idea mapping, which emphasizes problem description. However, the research focused on explaining a mindset known as design thinking rather than providing a detailed explanation of the practical HCD tool.	Public health Public Service	[43]
Personas-based approach	The research primarily focuses on the building of personas rather than providing guidance on how to effectively use persona and the rationale for the policy recommendations	Domestic energy retrofit programs	[44]
Beneficiaries' journey map	Bottom-up approach. Construction of a journey map with beneficiaries. Co-design and Co-deliver with beneficiaries.	Public service/ hospital	[45]
Simulation-based methods	Proactive evaluation and formulation of policies before their implementation. This study primarily explored the behaviour of the personnel responsible for implementing the policy, rather than the individuals who benefit from the policy (patient).		[40]
Prototype	Policymakers conduct a small-scale experiment to assess the response of citizens before implementing the policy on a larger scale	Urban planning	[39]
Model-based decision support system	The author considered the modeller “as a user, advisor, facilitator, integrator, and explorer”.	Investment decisions	[46]

collaborative development of environments for comprehending problems and social incubation [38]. The design methods also help to save resources. Incrementally increasing the scale and conducting tests throughout the process prevent major failures, ensuring that policies are feasible and efficient before widespread deployment

[39], [40]. Nevertheless, the number of research that elucidates the utilization of a specific HCD tool in the realms of policy-making and public service is limited. The tools can be categorized into two groups: those utilized in formulating policy and those employed in executing policy.

**3.2.2 Challenges of Implementing human-centred Design in Policy-making.** Several obstacles hinder the full implementation of HCD in policy making which can be classified into three categories: the inclusion problem [45], [47], the difficulties in alignment with the current policy system [48], [49] and the potential of oversimplification [47].

Primarily, HCD relies heavily on the active participation, commitment and consensus of stakeholders [38]. This raises concerns regarding the representation and inclusivity of stakeholders who are invited to participate in the policy project [40], [45], [48]. Thus, one of the challenges of applying HCD in policymaking is ensuring that all necessary population groups. Furthermore, it has the potential to disregard the perspective and opinions of marginalized communities which is hard to approach [47]. On the other hand, the design typically reflects the intentions and prejudices of its designers. Therefore, in the context of policymaking, HCD could serve as a political instrument [48].

HCD originated from the field of computers, which was developed long after the establishment of our policy structures that have been in place since the beginning of civilization. The second challenge pertains to the synchronization with preexisting political and bureaucratic structures [49].

Additionally, design software typically focuses on solving individual challenges while policy affects a multitude of individuals. Policymaking occurs within a socio-technical system that is intricately connected to political, historical, racial, and social factors, as well as the intersecting identities of communities. Consequently, it is more intricate... HCD tools have the potential to streamline and distil information into a format that is user-friendly and accessible for design purposes. The business can prioritize a specific customer segmentation while disregarding others, yet policies have impacts on the overall benefit to society, thus the method to design policy should have suitable adaption to comprehensively and intricately tackle intricate social problems [47].

## 4 DISCUSSION

The result of this study strongly supports the application of HCD in policymaking. The two-word clouds and the bibliometric visualization reveal a linkage and shared implications between the two topics “HCD” and “policymaking”. Design and policymaking are both iterative processes. Both topics have a profound influence on health, education, and technology, using data and information, and employing an analytical approach. Furthermore, it appears that the application of HCD in policymaking to address social issues is primarily driven by data exploration. Therefore, by integrating principles from both disciplines HCD and policymaking, a more evidence-based, comprehensive and efficient approach to tackling current complex social challenges could be achieved.

The systematic literature shows that HCD can be used in policymaking. However, these techniques were described in a non-detailed way, a methodology rather than a tool that can be directly implemented. Those methods primarily focused on the phase of understanding human behaviour, which is only one part of the multiple-step policymaking cycle. There was a lack of tools for decision-making, evaluation and communication. For example, numerous studies demonstrate that HCD can support understanding

people’s needs. However, what remains ambiguous is the cognitive process involved in the later stages, how and to what extent policymakers can use this insight to make policy decisions and implement the policy. Furthermore, the terms “user-centred design” and “human-centred design” have been used interchangeably. However, the research primarily focuses on “user-centred design” to develop policies that align with the needs of citizens, rather than delving into the involvement of other stakeholders such as service providers or policymakers. This raises the question of whether the HCD tools used in policy and public service are user-friendly for policy designers, therefore facilitating their work.

There are three types of obstacles when applying HCD in policymaking, including inclusion challenges in stakeholder engagement, alignment with the current policy system and the risk of oversimplification. Nevertheless, there is currently no study available that can effectively demonstrate how to address these problems. These findings highlight a research gap that future studies can explore to advance research in this field.

## 5 CONCLUSION AND PROPOSED FUTURE RESEARCH DIRECTION

This article focuses exclusively on the implementation of HCD rather than the broader application of design principles in public policy. By clarifying the HCD concept, the appropriate methods are examined when delivering public policies and services. Based on the identified research gap in the systematic review, future research should investigate the application of HCD methods at each stage of policymaking cycles. Moreover, future studies can enhance its scope by resolving the aforementioned hurdles in the implementation of HCD in policymaking. Besides, human factors techniques such as mental models, and system thinking could be used to explain how HCD can influence policy design and decision-making processes. Further more, given the scarcity of research research on how HCD can be used in policymaking, it is worth considering if policymakers and civil servants may draw any insights from software developer or commercial designers to formulate and deliver human-centric policy. This would allow for an investigation of how HCD might be adapted for use in policymaking.

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