

## Article

# ParlTech: Transformation Framework for the Digital Parliament

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**Abstract:** Societies are entering the age of technological disruption, which also impacts governance institutions such as parliamentary organizations. Thus, parliaments need to adjust swiftly by incorporating innovative methods into their organizational culture and novel technologies into their working procedures. Inter-Parliamentary Union World e-Parliament Reports capture digital transformation trends towards open data production, standardized and knowledge-driven business processes, and the implementation of inclusive and participatory schemes. Nevertheless, there is still a limited consensus on how these trends will materialize into specific tools, products, and services, with added value for parliamentary and societal stakeholders. This article outlines the rapid evolution of the digital parliament from the user perspective. In doing so, it describes a transformational framework based on the evaluation of empirical data by an expert survey of parliamentarians and parliamentary administrators. Basic sets of tools and technologies that are perceived as vital for future parliamentary use by intra-parliamentary stakeholders, such as systems and processes for information and knowledge sharing, are analyzed. Moreover, boundary conditions for development and implementation of parliamentary technologies are set and highlighted. Concluding recommendations regarding the expected investments, interdisciplinary research, and cross-sector collaboration within the defined framework are presented.

**Keywords:** digital parliament; digital transformation; legal tech; disruptive technologies; technology framework; parliamentary administrators; ParlTech; knowledge-driven processes; parliamentary hype cycle; semantic web



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## 1. Introduction

Organizations such as parliaments are complex systems that can be considered an ensemble of five different elements: Process, people, culture, structure, and information systems [1]. These entail the need for an organizational transformation framework that exploits the potential of information communication technology (ICT) [2]. Over the past two decades, the evolutionary use of workplace technologies in organizations has hybridized their use with human activities [3], forming a more complex environment [4] and an emergent human-AI hybrid digital assistant [5] or meta-human configurations as new forms of socio-technical systems [6]. ICT has the potential to impact all of these elements and involves the emergence of several digital/human configurations [3], reflecting the assembly of digital features with human intent and their performance within a complex organization, as in the case of parliaments.

However, even if the demand on ICT to design and implement changes within the parliamentary institution has been documented in previous decades [7,8], it is still unclear how and under which conditions this digital transformation takes place [9]. Within governance, in particular, ICT was found to skew the balance towards efficiency rather than

innovation, despite organizations expressing a need towards the latter [10]. Therefore, a two-step ICT-embedded organizational transformation, i.e., technical and social, can be hypothesized. Mergel et al. [11] (p. 12) go a step further and use the term digital transformation “to emphasise the cultural, organizational, and relational changes . . . to differentiate better between different forms of outcomes”.

The introduction of ICT is often combined with the transformation of an organization as a whole. Naturally, the technical elements of an organization, e.g., data and information systems, are impacted most. For this reason, in relation to digitalization, researchers have called for “digital ambidexterity”, which is the capability to dynamically balance the digital initiatives in terms of efficiency and innovation [12]. In contrast, the social system (culture and structure) appears to be less affected by digital transformation [13]. Generally, digital innovation for value creation in organizations such as parliaments unbundles and recombines linkages among existing resources or simply generates new ones. In situations like these, when changes are radical, digital disruption may emerge, with considerable effects for different actors [14].

Regarding parliaments, in recent years, a small number of studies have investigated their role as organizations that are managing new technologies [8,15]. Nonetheless, the e-Parliament concept is not new [16]. Since the early 2000s, several attempts, projects, and concepts have indicated that citizens can, and in fact should, be included and engaged in decision-making processes through tools, products, platforms, and integrated IT services that enable them to actively participate in interaction with policy makers [17]. Indeed, it appears that the use of digital technologies by traditional organizations such as parliaments is highly diverse, albeit existing studies mostly refer to a variety of tools that allow for the engagement of citizens [18]. It must be noted though that such concepts are still far from the manifestation of parliament as a digital democracy hub for online engagement, communication, cooperation, and interaction among citizens and legislators. Such a digital collaborative platform that is operated in a transparent manner could be a useful tool, particularly within the legislative process.

To date, little attention has been placed on the development of a theoretical framework for the transformation of a traditional public organization, such as parliament, into a modern digitally ambidextrous organization, because there are several pathologies [10]. A basic approach has been made with the technology acceptance model framework by Davis [19], which is currently in version 3 (TAM3). This is premised on the theory that the model helps explain a specific behavior, which in this case is usage, ease of use, or perceived usefulness, towards a specific target, using technology, and within a specific context (e.g., public administration, parliaments). Scarce literature is complemented by a small number of published digital strategies in parliaments that attempt to incorporate organizational transformation elements with digital technologies in a layered structure.

Ongoing development, e.g., within the ISA<sup>2</sup> European Interoperability Framework, is providing guidance towards interoperable digital public services [20]. Effectively, system architecture is leading to an ecosystem of tools and services with accurately defined functions and interfaces. Within this multi-stakeholder environment, a user-centric approach is favored, using agile and lean ICT methodologies for interoperable and secure systems that constitute legal data hubs, which are accessible and inclusive for all stakeholders. Nonetheless, for the parliamentary workspace, more than a simple platform with integrated tools and software applications is needed, especially in the policy formulation stage, where a large number of users, e.g., parliamentary actors and/or stakeholders, are typically involved. However, state-of-the-art intuitive integrated tools of the likes of e-participation services, social media campaigns, visualizations, and linguistic analysis have the potential to advance digital transformation of the policy cycle [21].

The emergence of disruptive technologies might complicate a linear evolutionary approach for the digital parliament. At the same time, they have the potential to strengthen parliamentary institutions and bridge the informational and processing gap towards the executive. Taking into consideration digital tools and solutions for the digital evolution

of parliaments [15,17], comparative reports for aspects of future parliaments [22], the World e-Parliament Report 2018 [23], and the evolution of digital technologies from the 2020 Gartner Hype Cycle for Emerging Technologies [24], this study describes a novel approach to the digital transformation of parliamentary organizations, both from a holistic perspective and the user's point of view. It does so by refining existing digital parliament concepts and discussing organizational vis-à-vis digital transformation. Moreover, an innovative digital framework is developed bottom-up using the findings from a survey of parliamentary experts, who constitute users of parliaments' digital systems. Finally, based on acknowledged technology trends, the definition of a "parliamentary hype cycle" identifies promising technologies of parliamentary relevance that could shape future e-Parliament systems.

The next part (Section 2) defines the methodology of research and the approach taken to create the survey on which the study is based, as well as the selection of a representative sample of intra-parliamentary actors. It is followed by Section 3, where the main findings are shown and discussed. These are used to define a framework for the digital parliament (Section 4), based on which a concise discussion of the most promising technologies is made based on the survey key findings (Section 5). The article concludes with the most interesting aspects in a parliamentary context and a brief outlook for further research (Section 6).

## 2. Approach and Methodology

The authors have opted to use a user-initiated approach to define the framework of a digital parliament. To obtain data related to the nature and attributes of the framework, a structured expert survey has been developed and sent to a carefully selected set of parliamentary actors/users/stakeholders [25]. An expert survey is preferable, since the object of scholarly inquiry is novel and complex, yet it directly affects the users as actors and actuators. Therefore, it is "more likely to find reliable information in experts' judgements rather than in documentary sources" [26] (p. 274). In expert surveys, i.e., special and limited populations, the sample size is small by design, and no representative sampling framework is required. Instead, for this study, purposeful sampling was utilized for data collection and their predominantly qualitative interpretation [27]. The main criteria, according to which the subjects have been selected as parliamentary experts, were: Expertise in parliamentary development, scholarly engagement, and international cooperation. Further selection criteria were applied to ensure the geographic and gender diversity of the sample.

The survey builds upon IPU's definition of the digital parliament, the drivers and barriers for its digital and organizational transformation [13], and Gartner's hype cycle [24]. They were used to create a set of questions designed to capture the user's perception of the digital parliament. The resulting survey contains 15 questions, which can be divided in five basic blocks:

1. Demographics (country, sector, scientific background).
2. Digitalization process (level, transformation, priorities, relevance).
3. Barriers and drivers of transformation (organizational, digital).
4. E-parliament trends (significance and importance).
5. Emerging digital technologies in parliaments (applicability, maturity, usefulness, and sustainability).

Next to general demographics questions, block 2 attempts to redefine the digital parliament. The perceived level of digitalization from the users' point of view is measured and linked to the organizational transformation. Priorities and themes of relevance are captured. The barriers and drivers of organizational transformation and their link with digital transformation is assessed within block 3. Having the 2018 IPU World e-Parliament report [23] as point of reference, block 4 then re-defines trends and key aspects of the digital parliament and introduces tools and services in the parliamentary context. The final block of questions (block 5) estimates the applicability, maturity, usefulness, and sustainability

of digital emerging technologies. On the detailed definition of these user experience (UX) terms, see [28,29].

The questions were carefully designed to facilitate the understanding of the parameters and the building blocks of an evolutionary framework for the digital parliament. Both language and terminology were adapted to the parliamentary context. Technology foresight, especially for niche parliamentary technology, or ParlTech, is a particularly difficult task. ParlTech goes beyond what is considered state-of-the-art and is based on emerging technologies that fully or partially automate or even advance processes of parliamentary nature. As such, it is to be differentiated from standard technology aiming to provide solutions to administrative/organizational issues.

The technologies that have been selected to be included in the survey, which eventually led to the creation of a parliamentary hype cycle, have been extracted from 2020 Gartner hype cycles (emerging technologies, legal and compliance technologies, and internet of things) and constitute direct projections of emerging technologies in the parliamentary workspace. In the course of an internal workshop, 13 specific technologies have been identified as promising ParlTech and included in the survey. Table 1 matches the technologies from Gartner hype cycles with the ones that are relevant for parliaments.

**Table 1.** Technologies for the parliamentary workspace.

#	Technology in Gartner	Corresponding ParlTech <sup>1</sup>
1	Adaptive ML	Recommender systems
2	AI assisted design	AI-assisted legal drafting/policy making ( <i>Legal AI</i> )
3	AI augmented development	<i>Virtual parliament</i>
4	Authenticated provenance	Smart contracts, <i>smart legislation</i>
5	Bring Your Own Identity	Identity as a Service for parliament apps ( <i>IDaaS</i> )
6	Citizen twin	<i>Digital twin</i> of parliamentary infrastructure
7	Composable Enterprise	<i>Rapid digital</i> and operational transformation
8	Decentralized (semantic) web	<i>Linked open data</i> and advanced legal services
9	Embedded AI	<i>Machine learning</i> solutions
10	Internet of Things (Services)	<i>Internet of Parliamentary Things</i>
11	Legal & compliance analytics	<i>Interoperability solutions</i> , integrated tools & services (legal informatics)
12	Ontologies and Graphs	<i>Ontological representation</i> of parliamentary entities and procedures
13	Social data	<i>Social media analytics</i>

<sup>1</sup> Short names appear in italics.

In the course of the article, the authors attempt to approach three particular research goals around the digital parliament:

- To redefine the main factors of digital transformation in parliament.
- To explore the possibility to create a parliamentary hype cycle.
- To specify the challenges and preconditions of an evolutionary framework.

The above survey design methodology constitutes a valid instrument to evaluate responses on the prerequisites and conditions of the digital parliament. While quantitative data have been collected (i.e., a Likert scale is used for quantitative evaluation), focus is placed on the qualitative evaluation of findings, in order to come up with a tangible approach for a digital parliament framework.

The survey has been sent to 53 MPs and parliamentary professionals, collectively referred to as parliamentary experts, covering 36 countries. A total of 32 persons from 25 countries responded, a response rate of 60.4%, which the authors consider particularly

high, given the complexity of the survey. The high response rate may be also an indication that these usually busy, high-level parliamentary experts considered the survey favorably. The responders originate from 25 different parliaments, which means that some parliaments are represented by more than one expert. For methodological reasons, even in countries with bicameral systems, experts were selected from a single chamber. Hence, the number of parliaments coincides with the number of their countries of origin. As a result, in the context of the study, the terms country and parliament can be used interchangeably. Based on the original survey design, a wide geographic distribution across five continents can be observed. The findings are comparable across countries due to the common criteria used for expert selection, i.e., parliamentary experts or MPs who meet the above conditions are more likely to provide comparable information on the digital parliament and its development than random parliamentary professionals. A significant part of survey respondents (around one third, i.e., 31.2%) are female. Basic sample demographics are presented in Table A1 (Appendix A).

Upon request, the participants received online support and technical guidance to complete the survey. Most of the queries referred to the last survey block related to emerging digital technologies. This was anticipated as, unsurprisingly for parliamentary experts, a dominant majority of the respondents have a social science background, i.e., more than one third owns a degree in law, with only 15.6% having a degree in informatics or engineering. The experts work in different sectors of parliament, e.g., in parliamentary committees, library and/or research service, and international relations. The broad distribution in parliamentary sectors is important because it provides for a holistic approach to the research topic.

Processing and presentation of the findings ensured anonymity and confidentiality of the individual contributions. The survey, as well as the raw data set, has been placed on an open platform (Figshare) for cross-analysis and further elaboration [30]. The survey results have been assessed for reliability using the Cronbach coefficient ( $\alpha$ ) for each of the blocks of questions, i.e.,  $\alpha = 0.88$  for block 2,  $\alpha = 0.76$  for block 3,  $\alpha = 0.89$  for block 4, and  $\alpha = 0.95$  for block 5.

### 3. Findings and Evaluation

Different blocks in the survey cater for gradual approximation of a digital parliament framework, starting with the perception of digitalization. There is a significant number of participants (46.9%) stating that the level of digitalization of their parliament is high or very high, while 37.5% rate it as moderate. The resulting average score in the seven-point Likert scale is 4.37 with a standard deviation of 1.31, i.e., 4.37 ( $\sigma = 1.31$ ), and gives an overall positive view of the level of digitalization in parliament. The extraordinary high values, i.e., approximately 85%, show that the users report that the level of digitalization is at least moderate. This could be a temporal effect, and can be partially explained through the overall positive effects of the pandemic to the digitalization of parliaments [31]. Nevertheless, it can be considered as a strong foundation for further digitalization efforts. Moreover, this overall positive perception allows the authors to assume that the subjects also have the necessary technological affinity to assess the fitness of a broad list of technologies in the parliamentary workspace.

From the organizational perspective, findings show that digitalization has mostly transformed processes (78.1%), data (75%), people (65.6%), and systems (62.5%), with similar Likert scores (1–5 scale): Data is 3.94 ( $\sigma = 0.88$ ), processes is 3.69 ( $\sigma = 0.86$ ), people is 3.66 (0.83), and systems is 3.88 ( $\sigma = 0.98$ ). The widespread perception that ongoing digitization is transforming data, information systems, and processes is not unexpected. It has already been the outcome of existing investigations (Tangi et al., 2020). However, one needs to consider whether the measured lower values in the digitalization effect on structure and culture, 3.31 ( $\sigma = 0.93$ ) and 3.25 ( $\sigma = 0.80$ ), respectively, are attributed to a certain cause. Regarding the current progress of the parliaments from digitalization, the aspects that the progress applies to (processes, people, culture, structure, systems, and



data) were all found to be non-independent, when examined in pairs (chi-square,  $p < 0.001$ , for all pairs). The authors believe that these parameters are still decoupled from the effects of digitalization, hence the observed difference. As a matter of fact, overall high acceptance values and inter-dependence seem to confirm that digitalization tends to holistically affect parliamentary organizations.

At the same time, findings show that the organizational transformation process that goes along with digitalization is significantly hindered by a number of factors, the most recognized being bureaucratic culture (65.6%) and resistance to change (62.5%). Likert (1–5) scores for bureaucratic culture and resistance to change are 3.63 ( $\sigma = 1.03$ ) and 3.53 ( $\sigma = 0.95$ ), respectively, which is similar to earlier findings [13]. This is an interesting result that is linked to the wider perception of parliaments as “traditional” organizations. The fact that digital transformation efforts have been acknowledged, be it as a response to the COVID-19 pandemic or not, shows that even high intrinsic barriers can be overcome, given the proper incentive or when reaching out to a greater objective. It is worth mentioning that experts are differentiated when it comes to roadmaps and planning, i.e., “only” 50% agree with the statement, with 3.50 ( $\sigma = 1.02$ ), a result that can be associated with findings from the 2018 IPU report [23]. This partially interprets the observed lack of digital strategies in parliaments. Moreover, the survey participants reported that the fear of innovation was the most serious condition that affected the level of digitalization of their parliament (Spearman’s Rank Correlation,  $p = 0.021$ ,  $\rho(30) = 0.406$ ). In the context of the institutional future, the greater objective is no less than to correspond to a digital societal shift while maintaining the institutional equilibrium.

Two thirds expressed that the organizational transformation process that goes along with digitalization is pushed by expected benefits for the main stakeholders, i.e., 3.72 ( $\sigma = 0.81$ ) in Likert scale (1–5), and strong top-down leadership, i.e., 3.47 ( $\sigma = 0.88$ ). Both are expected drivers, as the effects of benefits and incentives in public service are well documented (for a systematic review of the relevant literature, see [32]), as well as the positive impact of leadership [33].

Furthermore, parliamentary experts were asked to assess a series of digital trends and aspects from the 2018 IPU World e-Parliament Report [23]. Two years after the IPU report, the user evaluation can reveal an understanding of the transformation of former trends in today’s tangible systems and processes within parliaments. Additionally, it can serve as a qualitative indicator for the validity of evaluation of emerging ParlTech.

A huge majority of the experts (87.5%) perceive open and transparent legal data, as well as openness, accountability, and accessibility, as significant components for digital parliament. However, the exact degree of correlation between the production of legal data, for instance Big Open Legal Data (BOLD), and an increase in institutional accountability is unclear, and almost certainly depends on the individual organization. Yet, this finding is in-line with recent developments in legal informatics and the development of legal documents standards that are utilized by dedicated legislative drafting tools [34,35].

When recording priorities for the digital parliament, for most of the occasions (>90%), processes, data, and people are the experts’ preferences. System architecture is a high priority for roughly two thirds (65%) of the experts. For all of them, high Likert (1–5) scores (>4.3) are recorded, where data display extremely high Likert values 4.47 ( $\sigma = 0.57$ ). Furthermore, the identification of people as a priority is relevant to society representation, openness, inclusiveness, accessibility, accountability, communication, and engagement with citizens. At the same time, process is relevant with accountability, and system architecture is relevant with business process collaboration. Notably, these priorities coincide with preferable components of digitalization from an organizational perspective.

When describing the use of digital tools, services, and products in a parliament, the experts highly favored accessibility and openness (87.5%) as well as communication with citizens (84.3%) as relevant attributes. These preferences are highly ranked in (L)ikert (1–5), i.e.,  $L > 4.2$ , with  $0.68 < \sigma < 0.90$ . While these results are in-line with the aforementioned findings regarding digital parliament as a whole, it is worth highlighting the interaction

between citizens and systems, through careful and efficient design and implementation of digital components, tools, products, services [21]. These results confirm once more the IPU suggestions for an open, accessible digital parliament that communicates interactively with citizens.

The 2018 IPU report indicated that digital broadcasting and video streaming will gradually overtake traditional broadcasting, a finding that is supported by the majority of the experts from this study (78.1%). Other important IPU trends, such as inter-parliamentary support and political commitment to use digital technologies, are also confirmed by the present survey. Additional enabling factors, such as training and skills, earned similar high scores. Acquiring new digital skills is deemed necessary for public administrators to be able to participate in the design and operation of ParlTech. For this, novel training approaches are necessary that may involve national schools of government [36] and/or more unified schemes, such as the Interoperability Academy in the framework of the European interoperability framework.

When using digital tools, knowledge of how parliaments work seems to be a high barrier for greater citizen engagement for 68.7% of the respondents. Citizen engagement can be facilitated by parliaments through the use of social media ( $L = 3.50$ ,  $\sigma = 0.92$ ). One could derive that parliaments use social media mainly to report on parliamentary business, interacting with citizens only marginally [37]. Even further, there are several attempts to use innovative ICT tools for social media analysis, without limited impact [38,39]. Table A2 (Appendix B) presents the aggregated results of the above study parameters in the form of average scores on the five-point Likert scale ( $L$ ), along with the respective standard deviation ( $\sigma$ ).

The use of disruptive technologies derived from Gartner hype cycle for Emerging Technologies constitutes a pragmatic approach to define a first set of applicable technologies for parliamentary use. This has been demonstrated already for the broader e-governance sector [40]. The majority of experts identified linked open data and advanced legal services as the most promising technologies (59.3%), immediately followed by social media analytics and the virtual parliament (53.1%). Linked open data, when efficiently produced and distributed, is certainly a direct manifestation of the broader call for institutional openness and can lead, as seen above, to increased accountability of parliamentary actors. Virtual parliament is not a single, but rather a combination of technologies around virtual, augmented, mixed, and extended reality [41] and can be associated with widespread hype around these technologies. Nonetheless, one should not underestimate the marketing-effect in relation to the introduction of such technologies. An adequate marketing wrap could be an efficient passport into the parliamentary sphere for the discussed technologies.

On the other hand, it stands out that a significant number of the questioned users do not identify machine learning solutions and artificial intelligence (AI)-assisted legal drafting and policy making as particularly relevant for parliaments. In recent years, significant applications of AI technologies have found their way into governance. In particular, machine learning, as an expression of AI, is considered a mature technology with broad applications in GovTech (Government Technology) [42], albeit future utilization needs to be based upon responsiveness, efficiency, and fairness [43]. Thus, negative opinions may be related with technological maturity or the lack of relevant pilot/demonstrator applications. Indeed, survey users rated AI as well as blockchain-assisted technologies as less mature than others.

Regarding usefulness of technologies, virtual parliament, linked open data, and advanced legal services stand out for 68.7% of the experts. Additionally, social media analytics (59.3%) and rapid digital and operational transformation (53.1%) seem to be rather useful. Digital Twins represent “digital replications of living as well as non-living entities that enable data to be seamlessly transmitted between the physical and virtual worlds” [44] (p. 87). In parliaments, the concept, boosted by machine intelligence and cloud computing, could be used to monitor and optimize institutional functions and operations.

However, less than a third (31.2%) of the experts do not perceive the usefulness of digital twin infrastructure.

Sustainability of these technologies is a central issue. After all, lack thereof would be a major indicator to question investment in technologies below a certain threshold. Regarding sustainability of technologies that the users indicated as useful, almost all experts (96.9%) stated that these will provide added value to professional parliamentary work, while roughly eight out of ten (78.1%) believe that these will help provide usable and more interesting services to strengthen the democratic appreciation of citizens. Special mention is deserved for the option for empowerment of civic stakeholders favored by 71.9% of the experts, which practically confirms the finding that digital communication, e.g., through social media, can potentially re-link citizens and parliaments.

#### 4. Parliamentary Hype Cycle

The findings from the evaluation of the maturity, usefulness, and applicability parameters of emerging technologies were used to develop a parliamentary hype cycle that is based on the Gartner hype cycle concept [45,46]. Conceptually, the Gartner hype cycle depicts the expectations hype for new and emerging technologies versus time until they are adopted and have passed on to production. Based on the original Gartner plot, the following assumptions were made to assess the necessary parameters and create a respective chart for ParlTech:

- Maturity was matched to the Time parameter.
- Usefulness was matched to the Expectations parameter.
- Applicability was matched to the time scale that a technology is expected to reach the productivity plateau.

For the technologies as per Table 1 (short names are used; classified from lower to higher maturity), Table 2 shows the mean Likert scores (1–5) for these three parameters. The methodology was to create an XY chart of Maturity (Time) versus Usefulness (Expectations), with references to distinct stages of the hype cycle as defined by Gartner. Similar to the original plot, a third dimension (time to productivity plateau) was added for each technology data point via color code. Analysis of survey results led to the definition of two basic time frames for the parliamentary hype cycle:

- Mean Likert (1–5) score  $L \geq 3.00$ : Medium to high applicability.
- Mean Likert (1–5) score  $L < 3.00$ : Low to medium applicability.

**Table 2.** Maturity, usefulness, and applicability of ParlTech.

ParlTech <sup>1</sup>	(M)aturity [Mean L(1–5)]	(U)sefulness [Mean L(1–5)]	(A)pplicability [Mean L(1–5)]
Ontological representation	2.72	3.00	2.84
Legal AI	2.75	3.34	3.09
Smart legislation	2.75	3.22	3.19
Recommender systems	2.78	2.84	2.84
Digital twin	2.81	2.81	2.97
Machine learning solutions	2.94	3.31	2.97
Internet of Parliamentary Things	2.94	3.31	3.09
IDaaS	3.00	3.31	3.28
Rapid digital transformation	3.09	3.59	3.31
Interoperability solutions	3.22	3.59	3.50
Linked open data	3.25	3.81	3.56
Virtual parliament	3.31	3.72	3.41
Social media analytics	3.47	3.53	3.34

<sup>1</sup> Standard deviation, M:  $0.75 \leq \sigma \leq 1.02$ ; U:  $0.85 \leq \sigma \leq 1.06$ ; A:  $0.85 \leq \sigma \leq 1.13$ .

The chart depicts Maturity (X-axis) versus Usefulness (Y-axis), and it was based on their mean Likert (1–5) values (see Figure 1). The ‘noisy’ early part, attributed to the overall



low grading of the maturity parameter, has been normalized, an offset has been added, and the slope of the curve has been exaggerated to match the characteristic Gartner hype cycle form. Consequently, it results in a qualitative plot which depicts technology hype as perceived by the experts. Three characteristic stages of the Gartner plot, already in this form, are visible. The sharp rising part of the curve matches the “innovation trigger” followed by the “peak of inflated expectations”, i.e., the highest point in the curve. The curve then enters the decreasing slope of the “trough of disillusionment”.

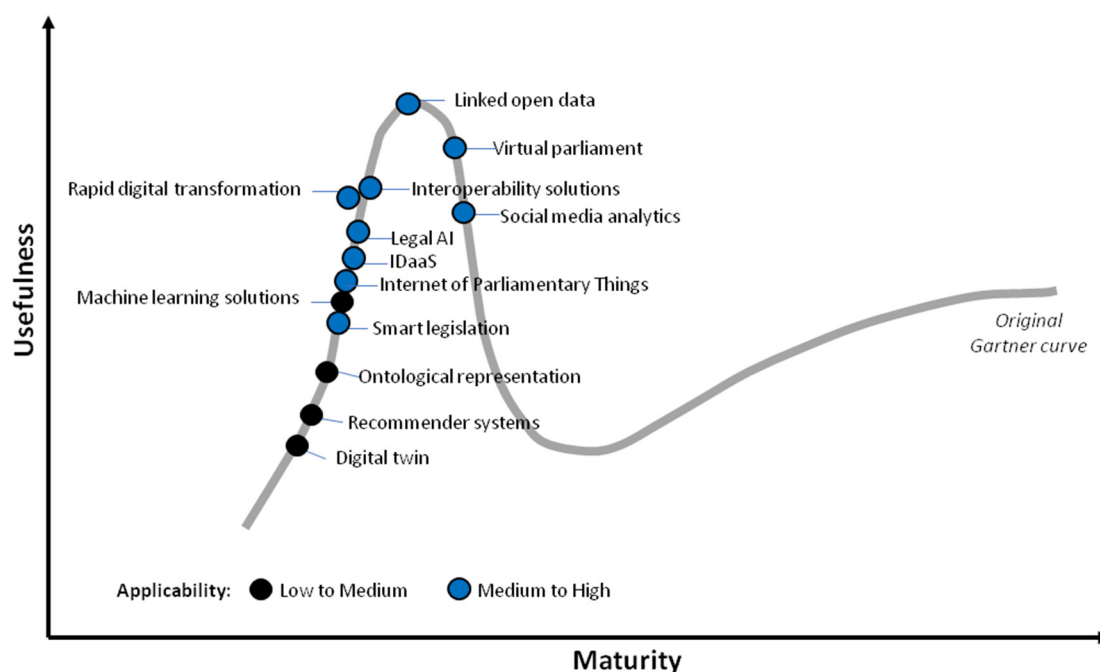


Figure 1. ParlTech hype cycle for year 2020.

Visibly, most ParlTech finds itself on the “innovation trigger” (potential breakthrough that might kick things off). It is noted that technology early in the hype cycle is perceived to be less applicable compared to technologies higher in the cycle. Digital twins, recommender systems, and ontological representation belong to this category. At the “peak of inflated expectations”, one finds linked open data and advanced legal services. This is the technology that enjoys the biggest hype, yet it is perceived to not be mature enough for entering production status. While moving further right on the maturity axis, but maybe still within the limits of the “peak of inflated expectations”, the virtual parliament along with social media analytics can be found. It can be observed that a similarity between Gartner and the parliamentary hype cycle lies in the fact that most technologies are located in the first two stages of the curve, where excitement and expectations are high. On the other hand, in contrast to Gartner, the here referenced ParlTech appears not to have reached the “trough of disillusionment” stage. In general, ParlTech is found to be delayed in terms of maturity and expectations compared to Gartner emerging technologies.

It is, however, worth noting differences when considering responses from digitally advanced parliaments (based on responses for the level of digitization with mean  $L(1-7) \geq 5.50$ ), namely Austria, Brazil, France, Israel, Libya, and Spain. Overall, higher maturity and usefulness scores are reached for respective technologies. All applicability scores are in the higher tier. Finally, specific ParlTech like digital twins seem to receive considerably higher scores. The assessment of survey results, combined with existing knowledge from previous studies, offer significant insights for the development of a digital parliament framework.

## 5. The Digital Parliament Transformation Framework

Considering all the above, a broad framework for digital parliament can be set-up. This framework will give the opportunity for parliamentary organizations to level the path towards advanced digital transformation stages. There have been earlier attempts to define such frameworks from other perspectives, e.g., in the form of organizational restructuring concepts or digital national plans. These frequently and solely rely on elaborated parliamentary strategies, as in the cases of the UK, Australia, Greece, and France. These attempts again have led to specific operational plans and actions within the digital environment [47,48].

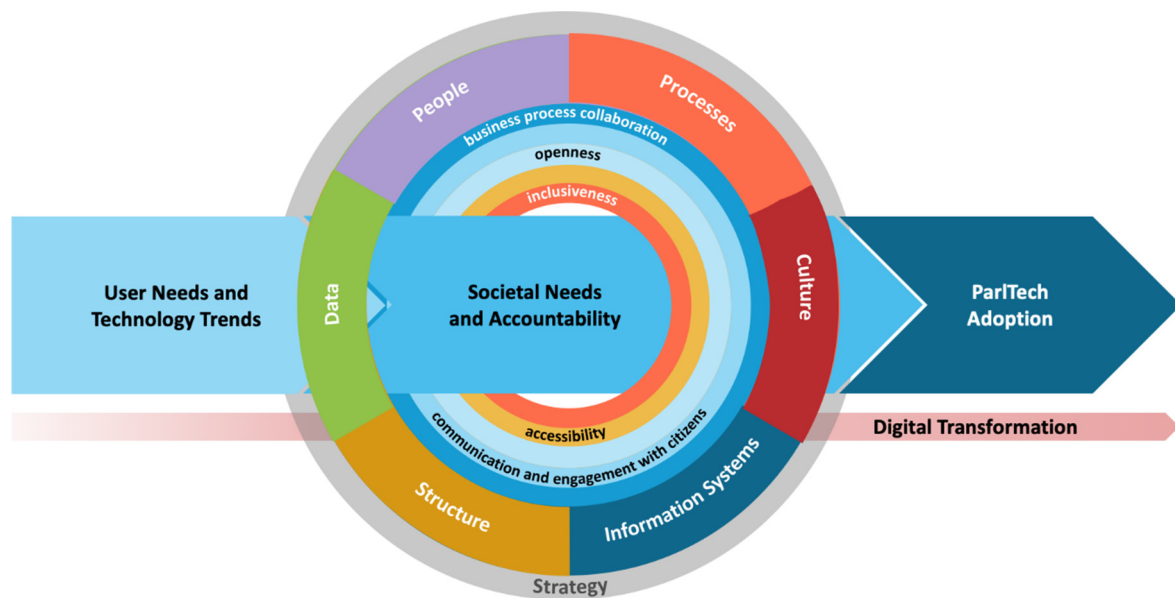
Matt et al. [49] presented five general principles, i.e., strategy, operations, functions, technologies, and transformation, upon which such a framework can be developed. Gimpel et al. [50] provide six fields of actions for digitalization, i.e., user, data, value, organization, operations, and transformation. Additionally, Nwaiwu [51] compared 10 conceptual and theoretical frameworks for digital transformation, which primarily deal with organizational issues rather than user behavioral aspects and technological adoption. Nwaiwu [51] concludes that the parameters to be considered when choosing a model for digital transformation are corporate strategy, vision, and mission.

In the light of the above, in a balanced act between strategy and technology, a robust yet adjustable structure for a parliamentary digital framework is defined. The framework consists of four distinct components that roughly correlate to the principles by Matt et al. [49] when unifying functions with operations. This becomes possible because in legislatures, parliamentary functions closely match primary working processes. Hence, the following components may constitute the basis of an advanced digital framework for parliament:

1. Strategy: An integrated strategy with a clear definition of a digital parliament vision and goals.
2. Operations: Digitalization of parliamentary operations.
3. Technology: Adaption to emerging technologies for digital growth using the parliamentary hype cycle.
4. Digital transformation: Develop and align the enablers of digital transformation.

An integrated parliamentary digital strategy is the main pillar of this framework that contains the organization vision, values, scope, and goals, with a clear definition of digitalization in the parliamentary context (e.g., openness, transparency, accountability, and societal representation). Significant attributes of the latter are provided in the evaluation part of this article with high correlation with people (users) as priorities of digitalization. The next step is an operational stage that is related to identification and planning of digitalization actions. Here, as highlighted by parliamentary experts, actions that are related to inclusive governance could be prioritized. These could include, for instance, parliamentary functions that strengthen citizen's engagement. Emerging technologies, as an expression of digital evolution, constitute a natural compound of any digital framework. Survey findings led to the creation of a parliamentary hype cycle, based on state-of-the-art and disruptive technologies adapted to parliamentary context.

Parliaments, depending on their level of digitalization and willingness for innovation, could screen the hype cycle to determine technologies appropriate for further utilization. An overview of necessary digital (and organizational) transformation enablers is suggested above and includes, among others, strong leadership, digital skills, and potential benefits for users. Figure 2 presents the proposed Digital Parliament Transformation Framework, based on the reported priorities (people, culture, structure, data, processes, systems) and the identified attributes that the ParlTech adoption is expected to enhance. However, there are a series of boundary conditions under which this framework can be useful for parliament. For instance, there might be an overlap with existing digital strategies or commitments, as is the case of Open Government Partnership. In such cases, parliament may opt to reassess its relevant digital plans under the light of the proposed framework.



**Figure 2.** Digital parliament transformation framework.

The above framework is more than a mere thought experiment. It relies on established knowledge and trustworthy data from a structured expert survey. Therefore, it can serve as a point of reference or an inspiration for parliament actors when planning digital strategies and action plans. However, there are several technology parameters that are yet to be defined with precision. At the same time, the authors are aware that the proposed framework may appear inexplicit, e.g., when defining the underlying principles or in the justification of a basic set of technologies. It needs to be noted that this was the intended purpose, since an overall too-stiff concept in the era of disruptive technology would risk being overturned all too soon.

## 6. Conclusions and Outlook

Parliaments are complex representative institutions that can benefit from on-going digitalization, particularly through the use of emerging technologies. The authors evaluated the results from a structured expert survey directed to internal parliamentary actors, parliamentary professionals and MPs, who constitute users of the tools and services of the Digital Parliament. Data, people and, unsurprisingly, information systems are still top priorities for parliament digitalization, thus confirming IPU's 2018 report [23]. On the other hand, societal barriers, such as culture and change, and lack of tangible strategies and plans, may hinder digitalization, even if there is no lack of resources. This is why stakeholders in parliaments play a significant role in organizational transformation, something which is also positively correlated with parliament digitalization (ANOVA  $p = 0.006$ ,  $F(3, 28) = 5.064$ ). Open, transparent legal data, which are inherently linked to increased accountability and accessibility, are also of significance. This, again, leads to the determination of parameters such as openness, accessibility, and communication with citizens as particularly relevant contexts for the digital parliament.

In terms of applicability, maturity, and usefulness, the evaluation of expert preferences pointed toward a number of technologies particularly interesting for parliamentary use, such as legal informatics, integrated tools and services, virtual parliament, social media analytics, and rapid digital and operational transformation. However, significant development efforts are necessary for them to be adapted, modified, and customized for use within parliaments. Parliamentary experts stated that these technologies will bestow added value to parliamentary professional work (internal environment). In addition, there are indications that such tools and services will strengthen the democratic appreciation

of citizens (external environment) by empowering and improving relationships between parliament and its civic stakeholders.

By combining quantitative findings with the qualitative approach of Gartner's depiction, a parliamentary hype cycle has been created. Indeed, Gartner proved to provide solid guidance to assess emerging ParlTech. According to the developed parliamentary hype cycle, technologies can be screened for suitability in the institutional workspace. Overall, an analogy to the original hype cycle can be observed, yet responses are concentrated in the prism of parliament use.

Nonetheless, the introduction of emerging technologies should be performed within a wider digital framework. The findings from this study enable the construction of a rigid framework for the digital parliament out of four components, i.e., strategy, operations, technology, and transformation, with specific boundary conditions for the utilization of novel parliamentary technologies. Within this framework, the user plays a central role in its design and implementation, having digitalization as an ultimate scope. For any given parliament, democratic tradition is deeply embedded in its organizational culture. Though indirectly accounted for when discussing ParlTech attributes (e.g., people and culture), the study of related deeper political, societal, and organizational perceptions, interrelations, and ethical structures is well outside the scope of this article, and further research is needed to cover this field.

The evaluation results from the survey produced comprehensive insight, whose detailed presentation goes well beyond the scope of a single publication. The authors will continue the study of the data to come up with novel insights that further elucidate the framework and individual components of the digital parliament. They also point at the online dataset made available to the research community and call for further interdisciplinary studies on the ParlTech field. As new digital technologies emerge at a high rate, increasing investments and cross-sectors collaboration within the defined technological and organizational framework are necessary for them to be efficiently deployed in the parliamentary environment. In addition, a more detailed view of individual technologies appears to be advantageous, possibly prioritizing the ones that are built on artificial intelligence background; for instance, recommender systems (for their use in parliaments see [52]).

Ultimately, under the light of the digital (r)evolution, one has to verify once again the very notion of the digital parliament. This study suggests that the parliament of the future will be more a mere aggregation of tools and technologies. This new parliament will still have strong social and procedural components (see also [11]). It is in the people's interest that the intra-parliamentary actors do not develop negative-biased perceptions for emerging technologies that have the potential to shape the future or legislatures. Tangible digital strategies and targeted re-education of personnel and parliamentarians to develop essential digital skills, a notion that is labelled as 'training' in the 2018 IPU e-Parliament report [23], seem to be inevitable steps towards the digital future of representative institutions.

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## Appendix A

**Table A1.** Basic sample demographics.

Continent	Europe	Asia	Africa	S. America	Oceania				
Country total	10	8	4	2	1				
Per cent	40.0	32.0	16.0	8.0	4.0				
Working sector	Committees	Library-Research	Int'l Relations	Legislative-Oversight	IT	Leadership	Training	MP	Transparency
Sector total	7	7	6	6	4	4	3	3	1
Per cent <sup>1</sup>	21.9	21.9	18.8	18.8	12.5	12.5	9.4	9.4	3.1
Academic background	Legal	Political science	Public Admin.	Information Science	Other <sup>2</sup>				
Total	11	7	5	5	4				
Per cent	34.4	21.9	15.6	15.6	12.4				

<sup>1</sup> More than one selection was possible; hence, the total percentage exceeds 100%. <sup>2</sup> Other: Economics, History, Higher Education Policy, and Urban Geography, each represented once.



## Appendix B

Table A2. Expert study aggregated results.

Digitalization											
Priority	Level of Digitization	People	Process	Architecture	Data						
Mean L (1–5)	3.10	4.31	4.34	3.81	4.47						
$\sigma$	1.31	0.74	0.60	0.69	0.57						
Relevance	Society representation	Lawmaking & oversight	Openness	Inclusiveness	Accessibility	Accountability	Effectiveness	Communication & Engagement	Business process collaboration		
Mean L (1–5)	3.59	3.97	4.31	3.94	4.28	4.16	3.91	4.31	3.59		
$\sigma$	1.13	0.86	0.78	0.91	0.68	0.72	0.78	0.90	0.87		
Digital Transformation											
Organizational Perspective	Process	People	Culture	Structure	Systems	Data					
Mean L (1–5)	3.69	3.66	3.25	3.31	3.88	3.94					
$\sigma$	0.86	0.83	0.80	0.93	0.98	0.88					
Organizational barriers	Lack of roadmap & plan	Lack of skills & knowhow	Personnel shortage	Lack of political support	Lack of managerial support	Organizational complexity	Lack of coordination	Resistance to change	Bureaucratic culture	Fear of innovation	Lack of budget resources
Mean L (1–5)	3.50	3.34	3.16	3.28	2.91	3.16	3.13	3.53	3.63	3.22	2.91
$\sigma$	1.02	1.23	1.25	1.08	0.86	1.11	0.91	0.95	1.01	1.01	0.93
Organizational drivers	Strong top-down leadership	Identify user needs bottom up	Internal status quo issues	Expected benefits (internal)	Expected benefits (external)	External society pressure	External legal obligations	Disruptive technology effects			
Mean L (1–5)	3.47	3.31	3.09	3.72	3.28	3.16	2.94	3.16			
$\sigma$	0.88	0.82	0.89	0.81	0.89	0.92	0.95	0.95			
Importance of IPU trends											
Trend	Embedded Digital technologies	MPs committed to digital technologies	MPs role diminished as ICT operational	Rise in XML adoption has leveled off	Use of social media messaging	Video stream overtakes traditional broadcasting	Barriers to ICT: training & skill deficits	Security and trust concerns among MPs & parliamentary administrators	Knowledge of work of parliaments: barrier to citizen's engagement	Parliament collaborates with PMOs <sup>1</sup>	Inter-parl. support in areas of ICT
Mean L(1–5)	3.34	3.63	2.91	3.06	3.50	3.94	3.81	3.78	3.84	3.28	3.69
$\sigma$	1.00	1.07	1.00	0.98	0.92	0.84	1.00	1.07	0.99	0.81	0.97

<sup>1</sup> Parliamentary Monitoring Organizations.

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