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Facilitating Smart City Development through Adaption of the Learnings from Enterprise Systems Integration

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Abstract: Cross-sectoral city systems integration is a necessity for Smart City Development (SCD) to provide real-time services to citizens. However, there is scant knowledge about integrating city systems, while the existing literature is replete with learnings on systems integration from private enterprises. Hence, the wisdom of Enterprise Systems Integration (ESI) can be utilised to integrate systems for SCD. Yet, there is limited knowledge on the association between these two contexts. This research aims to develop an innovative model, referred to as 'AdaptModel', that enables the adaption of the ESI learnings for SCD based on the differences and similarities between city and enterprise through qualitative research utilising literature analysis, semi-structured interviews, and document analysis. The findings show that the difference between cities and private enterprises from a systems integration viewpoint is in degree rather than in kind. Hence, using ESI learnings for the SCD context is valuable and informative, but it would be more complex, bureaucratic, time-consuming, and expensive. The research offers guidance in addressing the systems integration challenges associated with SCD based on interrelations between SCD and ESI; this is carried out by applying a novel approach of contextualising and modifying the ESI learnings to support cross-sectoral city systems integration.

Keywords: smart cities; smart city development; connected cities; enterprise systems; urban systems; systems integration

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Citation: Javidroozi, V.; Shah, H.; Feldman, G. Facilitating Smart City Development through Adaption of the Learnings from Enterprise Systems Integration. *Sustainability* **2022**, *14*, 3730. https://doi.org/10.3390/su14073730

Academic Editors: Jee Eun Kang, Roger Chen and Daniel Rodríguez Román

Received: 15 February 2022
Accepted: 20 March 2022
Published: 22 March 2022

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1. Introduction

The unpredictability of a city's environment and continuous changes in city policies, standards, and residents' needs are the most significant concerns of today's municipal authorities and public sector managers [1]. Fifty-five percent of the global population live in cities, and it is expected that this percentage will increase to 70% by 2050 [2]. It will cause further urbanisation issues if city operations remain unchanged [3].

Technological innovations, especially in city information systems, are utilised to deliver smart cities and connected communities. However, technology is only an enabler for cross-sectoral integration [1,4] and the 'smartness' results from an effective interconnection and collaboration amongst all city systems components, including processes, data, people, infrastructure, policies, governance, etc., [5]. As a result, a city can be regarded as a 'complex system of systems' [5–7]. This implies that city systems including energy, education, healthcare, transport, etc., should be considered as a whole to provide integrated, user-centric, efficient, cost-effective, and so-called 'smart' services for the citizens in real time to offer a liveable and sustainable environment for the citizens and enhance their wellbeing [2,7,8]. According to the systems thinking approach, when the system is considered a whole, any change in any component will affect the other elements, because they are interrelated and interconnected in order to deliver the specific goal of the system [9]. In addition, when information silos are reduced, an overall strategy for Smart City Development (SCD) will be improved [10]. Thus, complete integration of city systems is required as part of SCD in order to enhance interconnectivity and interoperability, establish a joined-up environment, and create seamless communication across city systems (sectors) and functions [7]. This will result in availability of real-time information across public sector organisations and agencies [5] in order to improve accessibility to public services, provide sustainable living, and deal with citizen and business needs in a smarter/integrated way [11,12]. Nevertheless, city systems integration includes a substantial digital transformation, which requires a precise adaption of best practices from successful systems integration accomplishments in similar contexts.

Integrating systems is a new concept in SCD, but it is utilised extensively in private enterprises, generally referred to as Enterprise Systems Integration (ESI), to facilitate interoperability, cross-departmental real-time information sharing, timely decisions, competitiveness, and handling fluctuating customer demands in an agile and flexible way. However, systems integration is a complex task that requires significant changes within the organisation's business processes, people, technology, and data that can lead to several challenges [13–15]. Nevertheless, success factors, best practices, approaches, tools, and techniques have been gradually recognised to address these challenges [7,16]. Conversely, very little scientific understanding of these matters is being utilised in the SCD context. In addition, to date the association between (smart) city and (integrated) enterprise and the usefulness of the ESI learnings for SCD has remained unclear.

Nonetheless, as explained by [17] both enterprises and cities consist of multiple subsystems, which collaborate to deliver high quality services to their customers (citizens in the cities). It is also evident that similar activities (e.g., Business Process Change (BPC), technology adoption, people engagement) are followed for integrating systems/sectors in SCD [18–20]. Hence, considering a city as a large-scale enterprise can also be meaningful to build SCD foundations on a similar ideology to ESI. Therefore, the lessons derived from private enterprises can be useful and valuable for SCD in the public sector (city as a whole), despite the complexity associated with integrating and enhancing interoperability across city systems [21] due to various sector services with multiple stakeholders and agencies. This is also supported by [22] and [23], who suggested that management in city and enterprise are not fundamentally different and that lessons derived from private organisations can be applied to cities. However, previously published studies that comprehensively and predominantly describe an approach for adapting ESI best practices for SCD are scarce.

This research acknowledges that ESI learnings would not offer ready-made solutions for developing smart cities and communities, but propositions that the learnings can be adapted by establishing and understanding differences between city and enterprise, referred to as 'contextual conditions' in this study. Accordingly, this research proposes an innovative model referred to as the 'AdaptModel' for adapting the ESI learnings for SCD based on adapting a series of conditions to the SCD context.

The next section explains the methodology of conducting this research. Section 3 will provide the findings from literature analysis, interviews, and document analysis and offers a framework as a contextual condition for adapting ESI learnings for SCD. Next, the results will be discussed and the AdaptModel will be developed in Section 4. Moreover, the application of the AdaptModel will be demonstrated for an SCD challenge in this section. Finally, Section 5 will conclude the research paper and will discuss the contributions and recommendations for further research.

2. Materials and Methods

The research adopts a qualitative data generation approach that employs three techniques: literature analysis, interviews, and document analysis.

A preliminary contextual condition for adapting ESI learnings for SCD based on differences between enterprise and city was structured and developed through literature analysis. Based on [23] the following factors: (i) accuracy, (ii) efficiency, and (iii) reliability were considered when reviewing the literature, resulting in selecting the sources from peer-reviewed articles and some most cited books based on the selected keywords. In addition, we replaced the keywords with synonyms to find other relevant sources. Moreover, we applied Boolean operators to create the following search terms to identify the most appropriate publications:

- 'Smart cities' OR 'connected cities' OR 'sustainable cities' OR 'smart city development';
- ('Enterprise systems' OR 'information systems') AND ('integration');
- ('City systems' OR 'cross-sectoral') AND 'integration';
- 'Public sector' AND 'change' OR ('public private sector' AND 'comparison') OR (public vs. private sector).

Scopus, IEEE, Science Direct, and Emerald online databases and Google Scholar were used for finding and accessing the resources. As the main movements related to BPC challenges started in the 1990s, only publications between 1990 and 2021 were reviewed. In addition, only publications written in English were included. Based on the keywords in total 415 publications including 370 academic publications were identified. After considering the three abovementioned factors, the sources were further filtered so that only 121 publications comprising 97 journal articles and conference proceedings, 14 books, and 10 company reports fulfilled the inclusion criteria and thus were fully reviewed and analysed. Then, the sources which included similar contents were grouped and the most relevant, most cited, and high-quality ones were selected to be utilised for this research.

Thematic analysis was used to analyse the literature to identify the differences between city and enterprise from a systems integration perspective. To supplement these findings, interview and document analysis were conducted to get more insights into the differences between cities and enterprises from a systems integration perspective.

A semi-structured web-based interview approach was used to encourage interviewees to talk freely about any experiences regarding the adaption of best practices from private enterprises for the public sector situations such as SCD. Then, the interviews concentrated on the differences between city and enterprise based on the themes identified during the literature analysis phase, resulting in the interview questions being grouped into four categories: (i) people, (ii) process, (iii) data, (iv) system.

The researcher audio recorded the interviews and took notes for analysis, comparison, and consolidation with the data generated from other participants and other methods. After every interview, the notes were also reviewed by the interviewer and the interviewee to ensure a common understanding of the responses. The interviewees included: (i) smart city developers such as consultants, advisors, and city authorities who were directly involved with SCD projects, and (ii) SCD solution providers from private enterprises. A combination of purposive, critical case, and snowballing sampling techniques were utilised in this study. Purposive sampling was employed to select interviewees based on their job affiliation, their ability to provide relevant information, and their roles. The interviewees were also selected based on the following criteria:

- Directly involved with SCD projects, especially in city systems integration;
- More than two years of experience;
- Fit in management or implementation role categories.

The critical case sampling was also utilised to select cities and companies according to their positions in the progress of SCD projects in the world. As the diversity of responses was significant in this research, at least one or two members from each city that demonstrated significant progress in SCD and at least one member from each solution provider were targeted for the interview. To reach the participants in the smart city developers' category, their smart city websites and professional social media (mainly LinkedIn) were reviewed. Some participants were also identified during events such as conferences and webinars. In the solution providers' category, people who had been involved with smart city projects and systems integration were selected for this research. The snowballing technique was also used to access more participants after each interview.

Table 1 shows a total of 31 interviewees, representing 32 cities and 11 organisations (some worked in both categories and/or in multiple cities) who shared their experiences. All interviewees had more than two years of experience in their role.

Table 1. Interviewees experience by city/organisation.

Interviewees	Smart City Experiences (Cities)	Total Number of Cities/Organisations Per Interviewee
Interviewee-1	Birmingham (England)	1
Interviewee-2	Berlin (Germany), Copenhagen (Denmark), Barcelona (Spain), Karlsruhe (Germany)	4
Interviewee-3	Santiago (Chile), Buenos Aires (Argentina), Sao Paolo (Brazil)	3
Interviewee-4	SAP	1
Interviewee-5	Jiangsu (China)	1
Interviewee-6	Service Birmingham	1
Interviewee-7	Responscity, Hyderabad Area (India)	2
Interviewee-8	Kyoto (Japan)	1
Interviewee-9	Belfast (North Ireland), Birmingham (England)	2
Interviewee-10	Tehran (Iran)	1
Interviewee-11	Stockholm (Sweden)	1
Interviewee-12	Amsterdam (Netherland), Atos	2
Interviewee-13	Copenhagen (Denmark), Trondheim (Norway), Smart City Catalyst	3
Interviewee-14	London (England), Birmingham (England), Siemens	3
Interviewee-15	Vienna (Austria)	1
Interviewee-16–19	Seoul, Korea	1
Interviewee-20	IBM	1
Interviewee-21	SAP	1
Interviewee-22, 23	Microsoft, Madrid (Spain)	2
Interviewee-24	Paris (France), Barcelona (Spain), Singapore (Singapore), Tokyo (Japan), San Francisco (USA)	5
Interviewee-25	Madrid, Spain	1
Interviewee-26	Rio De Janeiro (Brazil), Sao Paolo (Brazil), Madrid (Spain)	3
Interviewee-27	Madrid (Spain), Barcelona (Spain), Napoli (Italy), Berlin (Germany)	4
Interviewee-28	Madrid (Spain)	1
Interviewee-29	Siemens	1
Interviewee-30	Barcelona (Spain)	1
Interviewee-31	Pennsylvania (US), Boston (US), Kuala Lumpur (Malaysia), Melbourne (Australia), São Paulo area (Brazil), Beijing, China, Smart Cities Wheel (SCW), Baumann Consultancy Network	8

Forty documents published by 13 smart city authorities, 11 solution providers, and five guidance/standard providers as shown in Table 2 were analysed to improve the rigour and supplement the data collected from the interviews. Although some cities have not yet published useful or relevant information regarding their smart city projects, plenty of cities, governments, and solution providers have already produced several documents about their challenges, progress, and solutions related to SCD. Therefore, the authors selected documents published by the top smart cities in the world (based on the rankings provided by websites such as forbes.com) in which smart city projects have progressed more than others (e.g., New York, Paris, London, Copenhagen, Barcelona, etc.,), as well as the most popular solution providers such as SAP, IBM, CISCO, and Schneider Electric.

Table 2. The breakdown of the documents examined by type.

Publishers Document Types	Solution Providers	Smart City Developers	Standards/ Guidance	Total
Vision and mission statements	1	10	-	11
General reports	10	-	1	11
Progress reports	1	3	-	4
Government Proposals	-	1	-	1
Government reports	-	4	-	4
Guides	1	1	3	5
Standards	-	-	4	4

Thematic analysis was used to analyse the aggregated data from the interview and documents to identify themes and produce the descriptions for the differences between city and enterprise. It was managed by applying the initial codes and themes established through the literature analysis phase. Then, another thematic coding episode was conducted by randomly picking one of the transcripts or documents and identifying new themes based on their meanings, similarities, and relations. Next, the themes were utilised to extract relevant data from the aggregated data from the interview and documents so that the related differences were listed under the new themes. Finally, the identified themes and the listed differences were compared with the previous themes extracted from the literature; when new themes were identified, they were added to the existing list and grouped into an appropriate category. In all data coding phases, another researcher performed the thematic analysis for a random selection of the literature, interviews, and documents. Then, their themes were compared to the researcher themes to ensure the reliability and credibility of the data coding and avoid personal bias as suggested by [24].

After the analysis, the initial contextual condition was renamed to 'City versus Enterprise (CvE) contextual conditions'; that is the main organisational change management element to be considered for adaption of ESI learning for SCD. Next, the 'AdaptModel' was designed and developed to ensure that the ESI learning and best practices are regulated based on the CvE contextual condition for SCD context. The AdaptModel provides a direction for adapting the success factors, tools, techniques, and approaches from the ESI context for addressing the SCD system integration challenges. This was carried out using Bardach's smart practices approach, where the practices are tangible and visible behaviours for solving a problem [25]. The practice offers better results when applied to solving problems in a specific context. However, it might be challenging to collect data from a large sample to control for unsystematic variation. Additionally, conducting controlled experimentation of practices for new situations is very expensive, time-consuming, and unlikely to be feasible; thus, there should be a mechanism to apply the best practices in a similar context (adapting the best practices from ESI to the SCD context in this research). Bardach [25] refers to these as smart practices, which are available when there is latent potential to create value from previous practices and the mechanism(s) for extracting and focusing that potential to solve the problems in a new situation. In this research, the latent potential can be explained as creating value from the tried and tested best practices, approaches, tools, and techniques used to address challenges from the ESI context to potentially solve SCD systems integration challenges. Therefore, based on Bardach's smart practices approach, in this study the best practices, which are transferable and useful for the SCD context, were referred to as smart practices. In addition, the main components of the smart practices, which are adapted for SCD challenges, are the success factors. Moreover, the mechanisms for extracting and focusing this potential are also provided by making the association between city and enterprise and their challenges with the purpose of systems integration. The success of this adaption process depends on extrapolation of smart practices for the new situation, which includes the assessment and identification of safeguarding and the enhancement of strategies [25,26]. This was achieved by applying some modification actions through developing 'modifier gates' for every SCD challenge, based on differences between city and enterprise, to modify and precisely adapt ESI learnings/success factors for SCD. Accordingly, the CvE contextual condition should be adapted for every challenge in the SCD context based on the relevant differences between city and enterprise. As a result, the CvE contextual condition should be converted to modifier gates for every challenge; this study showed this by adapting the ESI context's success factors through a modifier gate for a challenge in the SCD context.

3. Results: Formulating a Comparison between City and Enterprise in the Context of Systems Integration

The findings from the three data resources of this study for identifying CvE contextual condition are provided in this section.

3.1. Findings from the Literature Analysis Subsection

Firstly, some general differences between enterprise and city influence the adaption process in this research. For example, as argued by [23], red tape and excessive bureaucracy in a city causes the decision making to be more laborious and lengthy for managers. According to [27], 'Red tape is a pathological side effect of bureaucracy.' Boyne [23] declared, 'Red tape today refers not to rules and procedures themselves but the delays and subsequent irritation caused by formalisation and stagnation.' However, as Ref. [22] concluded, this does not mean that private and public organisation managers are different in formalisation and organisational structure. In addition, size is a prominent factor that makes city and enterprise different and it has to be considered in all aspects of the city–enterprise comparison [28].

Moreover, in an enterprise the main decisions are made by managers and directors, who can apply their power to implement their opinion, but in a city citizens are the decision makers [29]; they also query where their money is being spent. Hence, there is limited freedom of funds allocation in the cities, therefore the financial budget is inflexible [30].

In addition to the above general differences, by considering a city as an enterprise (explained in Section 1) [17], city and enterprise can be compared according to three features of supply chain: suppliers, customers, and systems. Moreover, the core elements of systems integration—comprising people, processes, technology, and data—can be used for this comparison [6]. Nevertheless, customers and suppliers are already included in the people aspect. Additionally, technology is an enabler, which can be adopted for both ESI and SCD contexts. However, the type and implementation method of the technological solution is different and it can be realised based on a comparison between city and enterprise in other aspects. Consequently, apart from general differences, the comparison is carried out based on the four elements of: people, process, data, and system.

3.1.1. People

In an enterprise, customers, suppliers, managers, and all employees are in the people category. In a city, the customers are citizens who are living in a city, the suppliers provide services, and the municipal authorities are the managers who enhance citizen quality of life [11].

Like enterprises, the cities should provide high-quality training/education for people before conducting smart city projects. Education in cities should be continuous, dynamic, and motivating. All people from different backgrounds, cultures, and ages living in a city should also be included [31,32]. In addition, public sector staff professionalism is less in comparison with the private sector employees [19]. These factors make education more challenging in the cities, while training for systems integration in an enterprise would be on a much smaller scale and more effortless than in a city [33].

Another factor that makes the people aspect more difficult in a city than in an enterprise is that the level of commitment in a city is lower when compared with enterprise [23,34]. Moreover, municipal authorities are more political than enterprise managers, thus their decision making would be more influenced by political ambitions and targets [30].

Additionally, people working in public sectors are extrinsically less motivated when compared with people in private enterprises [35] due to management instability, which could be related to office politics. Thus, long-term plans such as integrating cross-sectoral systems in SCD would have less motivation [23]. Furthermore, there is limited competition in the delivery of services by public agencies, resulting in less incentive to attract more customers (as in private enterprises). Furthermore, less budget flexibility in cities decreases the motivations of the managers, who want to utilise only predefined resources and keep costs within the budget. Therefore, as Ref. [30] concluded, a top-down approach should be implemented for the process of change during SCD to guarantee the feasibility of the change and economic and political support. However, Refs. [19,36] argued that radical change in the public sector should occur incrementally and bottom up in order to involve all stakeholders, especially in the objective setting and early stages. As a result, this study supports the simultaneous execution of both approaches to involve all stakeholders, while providing maximum economic and political support and commitment from top management and authorities. Additionally, multiple stakeholders and different opinions in cities make it challenging to change and implement projects, especially regarding business processes [36].

Considering all the above contents and governmental and political restrictions, people-related challenges of systems integration are more troublesome and contentious in the cities.

3.1.2. Process

Business processes in cities are less flexible and more complex than those in enterprises. The existence of multiple stakeholders is the main reason for the complexity in cities. In addition, business processes are more time consuming than in enterprises. Excessive bureaucracy and red tape surrounding city processes make them lengthy and inefficient [18,23,34,37–40]. Although excessive bureaucracy and red tape were discussed as general differences earlier, these are more significant in the process aspect.

Moreover, Ref. [41] have concluded that BPC across urban systems is more radical than in an enterprise due to greater complexity in the public sector. Furthermore, business processes in cities have been designed based on legal regulations and policies. Thus, any BPC in cities must be aligned with legal compliance and approved by all stakeholders [30].

3.1.3. Data

The entwined relationships between government agencies, political and legal constraints, data protection, confidentiality, etc., make it more challenging to deal with data in cities than in private enterprises [42].

Differences between city and enterprise from a data perspective are more significant due to three aspects: (i) availability, (ii) accessibility, and (iii) information and knowledge sharing [42,43]. For example, the sharing of interorganisational information in cities is strongly influenced by policies and legislation. Data are also less accessible in cities. The public sector has less availability of information than private organisations [43]. Moreover, access to data in cities is more time consuming than in enterprises; this can be a consequence of greater interdependencies in public organisations [44]. In cities, we also deal with large scale data and information [45].

3.1.4. System

The subsystems within an enterprise system are mostly departments from the same enterprise with common ambitions and objectives. However, a city is a system of systems and comprises sectors with many departments that are also large and complex [46]. Similar to enterprises, these departments work as systems. This makes systems integration in cities more complicated than in enterprise systems. A smart city is also a system of complex systems. Thus, communication and cooperation among city systems would be more difficult, time-consuming, and bureaucratic. Moreover, the development of an integrated city requires all city systems and departments to be integrated and connected efficiently. Then, that city can be considered a whole [6,47].

3.2. Findings from Interviews and Document Analysis

During interviews and document analysis, most of the differences between city and enterprise pointed out in the previous section were highlighted by the interviewees and documents. For example, many interviewees described the significance of red tape in cities. Based on their opinion, rigid conformity in cities is a massive barrier to change. It creates a large number of redundancies, which hinder the decision making and the implementation of city systems integration. An interviewee said:

> *'Red tape would not let us develop smart cities and I don't see a full smart city in the near future.'*

A few interviewees and several documents also highlighted the higher complexity in cities in comparison with enterprises. Accordingly, an interviewee said:

> *'Cities are highly complex and we usually don't view them as complex system of complex systems. If we view a city that way we can analyse it easier and perhaps develop smart cities. Nevertheless, in my opinion, we should firstly improve the complex systems of a city, integrate them, and make them efficient, then try to connect them together.'*

Several documents also emphasised that decision making in cities is challenging and much lengthier than in enterprises. This is because of massive amounts of complexities, political influences, bureaucratic business processes, and decision making by multiple stakeholders in cities.

Nevertheless, several new facts regarding the differences between city and enterprise were also obtained through interviews and document analysis.

For instance, some interviewees pointed out that cities are places for living, while companies are places for working. Hence, city inhabitant power is much more than enterprise worker power. As a result, 'commanding heights' in the cities do not work as they work in enterprises. Accordingly, an interviewee commented:

> *'There in a company environment you are hiring and firing for not following orders and the command; the line of authority is more, is stronger in the private sector than, in my experience, in the public sector.'*

Another difference, which a few interviewees pointed out, was about priorities in cities and enterprises. For instance, a contributor said:

> *'Enterprise doesn't have the priorities that a city has. So, a city has competing priorities, whereas an enterprise has one outcome that it wants to achieve, which is building a quality product, which might have different characteristics.'*

Some interviewees and documents discussed the insularity of the city systems and argued that if the city is considered a whole entity, its systems/sectors which are working for a common goal (providing services for citizens) should also be intercommunicated and interoperated as a whole; yet, this is not happening now. Another interviewee argued about the lack of integrated strategies in cities in comparison with corporations. Furthermore, some interviewees and documents pointed out that there are different languages for similar business processes in multiple city systems, agencies, and sectors; meaning that the same processes in other city sectors may be described differently.

3.3. CvE Contextual Condition

After considering the results from the interviews, document analysis, and literature analysis, a comprehensive list of differences between city and enterprise is offered from a systems integration perspective. Thus, CvE contextual condition is developed and represented in Table 3.

Table 3. CvE contextual condition.

Aspects	City	Enterprise
General	Excessive bureaucracy and red tape	Generally, less bureaucracy and no red tape
	Very large with thousands/millions of residents	Smaller scale with no residents
	Commanding heights do not work as expected	Commanding heights are important and do work
	High customer power in decision making	Customers have no power in the decision making
	Limited freedom of funds allocation	Managers are relatively free to allocate funds for various projects
	Competing and complicated priorities	Limited priorities that can always be changed
	Lack of integrated strategies	Strategies are mostly integrated into successful enterprises
People	Lengthier decision making	Quicker decision making
	Lower level of proficiency of staff	Staff are more proficient in their role
	Education (training) is challenging and for all people	Training is easier and is for specific groups of staff
	Lower level of commitment	Higher level of commitment
	Nearly all managers are political people	Managers are rarely political
	High level of political influence on decisions	Limited political influence on decisions
	Limited motivation for change	Broader motivation for change
	Frequent changes occur in management positions	Managers are usually in their position for a long time
	Limited competition in delivery of services	There is competition in delivery of services
	Multiple stakeholders	Limited number of stakeholders
Process	Low flexibility of processes	Processes are more flexible
	Bureaucracy and red tape in the cities are critical issues	Generally, level of bureaucracy and red tape in enterprises is not significant
	High level of complexity	Business processes are less complex
	Different languages for similar business processes	A common language for nearly all business processes within an enterprise
	Business processes in the cities are less agile and with lots of redundancies	Business processes are mostly agile and with fewer redundancies
	High level of radicalness for radical changes	Level of radicalness for radical changes is low
	Process design is based on legal regulations and policies	Process design relies on company targets and strategies
	Very high level of interdependency	Low level of interdependency
Data	Data management is difficult	Data management is easier
	Limited availability of data	Sufficient data are usually available
	Accessibility of data is limited and time consuming	Data are accessible
	Data sharing is strongly influenced by government policies and legislation	The internal policies of the organisation influence data sharing
	Scale of data and information is large	Scale of data and information is small
System	System of systems	Comprising departments
	Subsystems are big, complex, and they are called sectors, comprising organisations and departments	Subsystems are the enterprise departments
	High level of complexity	Low level of complexity
	Communication between systems is difficult, time consuming, vertical, and bureaucratic	Communication between systems is easier, quicker, and mostly horizontal
	Insularity is highly noticeable	Insularity is less noticeable

These conditions can now be utilised to implement the adaption of ESI learnings to address the systems integration challenges in SCD, where smart practices are available from the ESI context. However, the adaption is not a one-size-fits-all for city systems integration challenges. Each city should develop a plan that addresses its challenges. In other words, experiences from ESI would not provide a single tailor-made solution for all cities, however they help to provide a guide for addressing SCD challenges. Thus, success factors can be adapted for various cities, but the implementation plans are different [6,18,48]. Nevertheless, as the adaption process cannot address all the SCD challenges, innovative success factors and related practices should be developed for those with no smart practice adapted from ESI. In addition, this research has collected data regarding normal size cities and Small to Medium Enterprise (SMEs), meaning that the data collected from very large and complicated enterprises as well as small cities and villages may be different; for example, the level of bureaucracy in large enterprises might be higher than in a small city.

4. Discussion: The AdaptModel as an Innovative Approach for Adaption of the Learnings from ESI for the SCD Context

As shown in the CvE contextual condition, the differences between city and private enterprises from a systems integration viewpoint are in degree rather than in kind. For example, in comparison with enterprises the importance of success factors in cities is higher because city processes are more complex. Additionally, systems integration in the cities should involve all stakeholders while providing maximum support from municipal authorities. Hence, the use of organisational change management practices from the private sector (ESI) provides a useful, valuable, and informative starting point for addressing city systems integration challenges [19,20].

Nevertheless, not all the contents of the CvE contextual condition would be applicable for an SCD challenge. For example, a process change related challenge in the SCD context might be mostly associated with the differences in the process and the general fields. Besides, some success factors from the ESI context may not be applicable for SCD, while others can be merged. For example, the use of several frameworks, approaches, and techniques that have been developed to guide systems integration in the ESI context (e.g., the approach developed by [49]) may have been identified as success factors for ESI, but they may not be necessarily applicable for the SCD context; meaning that new frameworks and guidelines may be needed for SCD. Another example is that a top-down approach has been suggested by [30] as a success factor for changing processes in ESI, yet a top-down approach may not be applicable for city processes, which are more complex, bureaucratic, and cross-sectoral. The consequence of these modifications and reductions is a generation of some specific success factors for systems integration challenges in SCD; therefore, consideration of the ESI learnings creates several preliminary success factors for the SCD context. However, these will be converted to actual success factors by applying modifier gates. In other words, the adaption is performed through modifier gates, which are developed based on the differences between city and enterprise (CvE contextual condition) related to a particular systems integration challenge. This approach is illustrated in Figure 1 as an AdaptModel for adapting the learnings from ESI for the SCD context.

As shown by the above AdaptModel, the modifier gates are applied for every ESI learning that can be adapted from ESI to SCD context. Accordingly, the CvE contextual condition is converted to a modifier gate for every challenge (modifier $_x$ for challenge $_x$) so that the adaption is carried out based on modification factors obtained from the CvE contextual condition. In general, the CvE contextual condition shows that the application of ESI learnings for systems integration challenges in SCD would be more difficult, more complex, more bureaucratic, more time consuming, and more expensive. Thus, these modification factors apply to all success factors in the SCD context. They are called 'general differences aspects' in this research. Moreover, other modifications are accomplished for particular learning according to the modifier gates of every challenge. The modifier gates adapt the ESI learning for the SCD context in five general ways; for example, to regulate some success factors from ESI for the SCD context the following actions can be taken:

- The success factors and their descriptions are changed and explained based on SCD characteristics (Major Change);
- Only the success factor descriptions are changed (Minor Change);
- The success factors, including their descriptions, are identically utilised for SCD context (Utilise);
- The success factors are merged (Merge); and/or
- The success factors are reduced as they are not useable for the SCD context (Reduce).

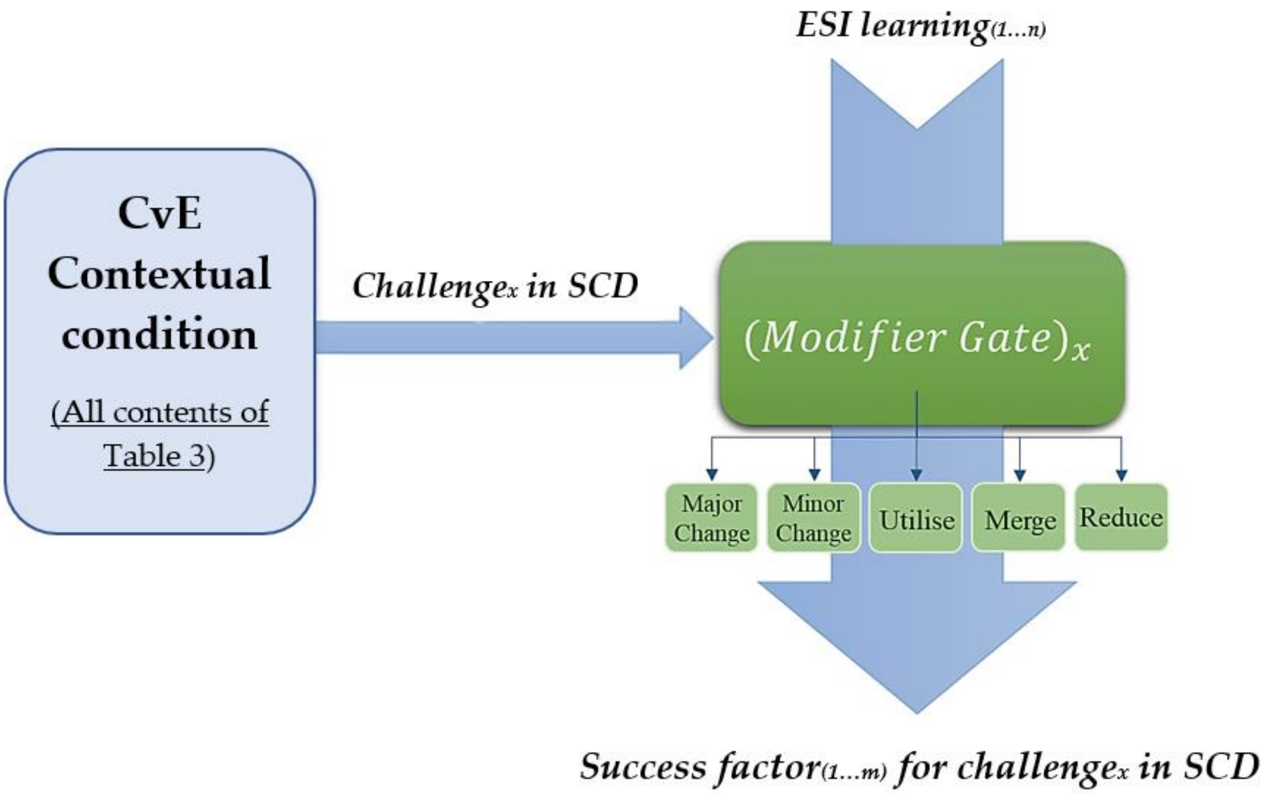

Figure 1. The AdaptModel for adaption of the learnings from ESI for the SCD context.

This process is applied to all ESI learnings to address relevant SCD challenges. As a demonstration of the AdaptModel and modifier gates mechanics, the process of adapting success factor exemplars from the ESI context for a process change related challenge in SCD is outlined next.

The AdaptModel Demonstration

Understanding city processes is a process-related challenge in city systems integration [50] and it is equivalent to the following Business Process Change (BPC) challenge—clarification and understanding of business processes—in the ESI context [20,51–54]. Seven success factors have been proposed to address this BPC challenge from the ESI context [20,51,52,55,56]; these are regarded as Hypothetical Preliminary Success Factors (HPSFs) for addressing understanding city processes in SCD:

(1) Analysing and assessing the existing business processes in detail before the change (HPSF-1);
(2) The realisation of the need for BPC (HPSF-2);
(3) Clarification of the process of BPC for all involved people (HPSF-3);
(4) Training sessions for employees to understand business processes and BPC (HPSF-4);
(5) Visualisation of business processes (HPSF-5);

(6) Business networking: understanding the relationships between business functions (HPSF-6);
(7) Business process collaboration management (HPSF-7).

These success factors are then passed through a modifier gate (formulated based on the relevant factors of the CvE contextual condition and shown in Table 4) for this particular SCD challenge.

Table 4. Modifier gate for addressing the challenge of understanding city processes using the ESI learnings.

Aspects	City	Enterprise
General	Excessive bureaucracy and red tape	Less bureaucracy and no red tape
People	Nearly all managers are political people	Managers are rarely political
	Limited motivation for change	Broader motivation for change
	Multiple stakeholders	Limited number of stakeholders
Process	Low flexibility of processes	Processes are more flexible
	Bureaucracy in the cities is a critical issue	Level of bureaucracy in enterprises is not significant
	Different language for similar business processes	A common language for nearly all business processes within an enterprise
	High level of complexity	Business processes are less complex
	Business processes in the cities are less agile and with lots of redundancies	Business processes are mostly agile and with fewer redundancies
	Process design is based on legal regulations and policies	Process design relies on company targets and strategies
	Very high level of interdependency	Low level of interdependency
System	System of systems	Comprising departments
	Subsystems are big, complex, and are called sectors, comprising of organisations and departments	Subsystems are the enterprise departments
	High level of complexity	Low level of complexity
	Communication between systems is difficult, time consuming, vertical, and bureaucratic	Communication between systems is easier, quicker, and mostly horizontal

Hence, after adaption by the modifier gate these HPSFs are converted to the five Actual Success Factors (ASFs) as follows:

(1) Analysing and assessing the existing business processes and business networking (understanding the relationships between business functions (ASF-1). Achieving this success factor requires more effort in cities due to barriers such as excessive bureaucracy and red tape, political managers, multiple stakeholders, and process design based on legal policies and regulations that increase the difficulty of access to the business processes. Moreover, as the city processes are more bureaucratic, more complex, and more time consuming, analysis and assessment of existing business processes should be accurately planned by considering all stakeholder advice and opinions. Additionally, the appropriate time should be allocated for it; all stakeholders, especially politicians, should agree with it. Furthermore, business processes and their specifications should be defined and documented. Additionally, as similar processes may be named differently in a city, a standard description should be defined for every city process;
(2) Realising and clarifying the need for BPC and defining it, along with informing all stakeholders and political entities (ASF-2);
(3) Clarification of the BPC process for all involved people and stakeholders, especially politicians, and offering assurance for the new processes that would still be aligned

with legal regulations and policies (ASF-3); this assurance would also increase their motivation to change;

(4) Scheduling effective training programmes for all involved people to learn the plan and process of understanding business processes and BPC, as well as educating citizens to use transformed services (ASF-4); and

(5) Visualisation of city processes (ASF-5); this would be more difficult than visualising enterprise processes as the processes are more complex and interdependent. Therefore, business processes should be segmented and the whole city processes should be converted to smaller models. Then, the visualisation should be carried out by prototyping and designing smaller models of the processes. Then, the relationships amongst the segments should be made [57,58]. As a result, innovative Business Process Modelling (BPMo) techniques should be developed to visualise and model city processes, meaning that this challenge cannot be addressed by adding some elements to the existing BPMo techniques (such as BPMN and UML). Thus, current BPMo techniques need to be transformed to provide intelligibility, conciseness, intuitiveness, uniformity, clarity, and adaptability [59].

The AdaptModel transformed the seven success factors from addressing clarification and understanding of business processes in the ESI context to Actual Success Factors (ASFs) that can manage the understanding city processes challenge in the SCD context. It also identified changes or improvements required in modelling techniques to support the visualisation of city processes. Thus, using the AdaptModel would help address the challenges associated with integrating with city systems as part of SCD by offering tried and tested solutions tailored through the modifier gates for each challenge in the SCD context.

5. Conclusions

The paper considers the city as a system of systems, suggesting that the different sectors are interrelated and interoperated to undertake the common purpose. The study findings suggest that integration is an essential component of an effective SCD, highlighting the importance of holistically considering the core pillars of integration, i.e., process, people, technology, and data.

Generally, systems integration in cities is more complex, challenging, lengthy, and bureaucratic. Despite the complexity, it is possible to integrate the city systems by applying the lessons derived from private organisations in which systems integration is an established concept. It is acknowledged that the learnings from ESI cannot be blindly applied to SCD; instead, it should be adapted based on the difference between these two contexts.

The paper establishes the association between (smart) city and (integrated) enterprise to utilise ESI success factors for SCD and developed CvE contextual condition, modifier gates, and AdaptModel, used to manage the adaption of the learnings from the ESI context to address SCD challenges. However, this study's findings indicate that the use of private sector best practices will provide a practical, valuable, and informative starting point for addressing systems integration challenges in the cities. The use of AdaptModel and modifier gates is a novel approach to utilise learnings from the ESI context by adapting them based on the CvE contextual condition to address a particular SCD systems integration challenge. In view of that, the CvE contextual condition is a critical element required to be converted to a specific modifier gate for every systems integration challenge in SCD. Thus, the AdaptModel can support the city authorities to develop smart sustainable cities, especially from the city systems integration viewpoint. It will act as a guidance, which is customisable for addressing any SCD challenge and will assist the smart city developers to accurately utilise the ASFs by utilising the learnings from ESI, while the characteristics of a city are fully considered. Consequently, it will help the city authorities and decision makers of the cities that intend to transform to smart cities to understand their SCD status before implementing SCD projects. Moreover, planning to adapt the learnings from the ESI context will guide them to develop their SCD roadmap. In addition, through the use of the AdaptModel this paper proposes some preliminary success factors for the SCD context that can be used by smart city developers, planners, and solution providers to support their SCD-related projects in the future.

In this research, a logical generalisation was drawn from the qualitative data to establish the differences between city and enterprise; this was used to facilitate the adaption of best practices from private enterprises for SCD. Further studies could undertake a quantitative approach to explore the associations proposed to offer a probabilistic inference, either similar or conflicting arguments to those presented in this study. For example, a quantitative study can be conducted to understand the corelations between the systems integration elements in SCD and ESI contexts or the correlations between the characteristics of city and enterprise from people, process, data, process, or any other aspect. Additionally, future research could apply the proposed AdaptModel during SCD to provide a detailed understanding of the dynamic nature of city systems integration in various aspects and how ESI learnings could be used for effective SCD and addressing the associated challenges. Furthermore, future research could explore other aspects associated with the adaption of the learnings from ESI to SCD context; for example, further research could explore the social aspects of the adaption, including spatial thinking to enrich the incorporation of best practices from ESI to develop a more citizen-centric smart city.

Author Contributions: Conceptualization, V.J., H.S. and G.F.; methodology, V.J., H.S. and G.F.; validation, V.J.; formal analysis, V.J.; investigation, V.J.; resources, H.S.; data curation, V.J.; writing—original draft preparation, V.J.; writing—review and editing, V.J., H.S. and G.F.; visualization, V.J.; supervision, H.S., G.F.; project administration, V.J. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding and "The APC was funded by the Faculty of CEBE of Birmingham City University".

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and the Birmingham City University's Research Ethical Framework to meet the five commitments of 'The Concordat to Support Research Integrity' (https://icity.bcu.ac.uk/Research-Community/Research-integrity) and approved by the Institutional Review Board of Birmingham City University (BCU Research Ethical Framework 2010).

Informed Consent Statement: Semi-structured interviews were conducted during this research. Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Mayaud, J.R.; Tran, M.; Pereira, R.H.M.; Nuttall, R. Future access to essential services in a growing smart city: The case of surrey, British Columbia. *Comput. Environ. Urban Syst.* **2019**, *73*, 1–15. [CrossRef]
2. Rahman Sabory, N.; Senjyu, T.; Danish, M.S.S.; Hosham, A.; Noorzada, A.; Amiri, A.S.; Muhammdi, Z. Applicable smart city strategies to ensure energy efficiency and renewable energy integration in poor cities: Kabul case study. *Sustainability* **2021**, *13*, 11984. [CrossRef]
3. Kirimtat, A.; Krejcar, O.; Kertesz, A.; Tasgetiren, M.F. Future trends and current state of smart city concepts: A survey. *IEEE Access* **2020**, *8*, 86448–86467. [CrossRef]
4. Gil-Garcia, R.; Gasco-Hernandez, M.; Chen, T.; Pereira, G.V.; De Azambuja, L.S. Smart sustainable city roadmap as a tool for addressing sustainability challenges and building governance capacity. *Sustainability* **2022**, *14*, 239.
5. Komninos, N.; Kakderi, C.; Panori, A.; Tsarchopoulos, P. Smart city planning from an evolutionary perspective. *J. Urban Technol.* **2018**, *26*, 3–20. [CrossRef]
6. *PAS 181:2014*; Smart City Framework. BSI: London, UK, 2014.
7. Javidroozi, V.; Shah, H.; Feldman, G. Urban computing and smart cities: Towards changing city processes by applying enterprise systems integration practices. *IEEE Access* **2019**, *7*, 108023–108034. [CrossRef]
8. Jo, S.-S.; Han, H.; Leem, Y.; Lee, S.-H. Sustainable smart cities and industrial ecosystem: Structural and relational changes of the smart city industries in Korea. *Sustainability* **2021**, *13*, 9917. [CrossRef]
9. Checkland, P. Systems thinking. In *Rethinking Management Information Systems: An Interdisciplinary Perspective: An Interdisciplinary Perspective*; OUP Oxford: Oxford, UK, 1999; p. 528.

10. Bjørner, T. The advantages of and barriers to being smart in a smart city: The perceptions of project managers within a smart city cluster project in Greater Copenhagen. *Cities* **2021**, *114*, 103187. [CrossRef]
11. Chourabi, H.; Nam, T.; Walker, S.; Gil-Garcia, J.R.; Mellouli, S.; Nahon, K.; Pardo, T.A.; Scholl, H.J. Understanding smart cities: An integrative framework. In Proceedings of the 2012 45th Hawaii International Conference on System Sciences, Maui, HI, USA, 4–7 January 2012; pp. 2289–2297.
12. Hsu, W.-L.; Qiao, M.; Xu, H.; Zhang, C.; Liu, H.-L.; Shiau, Y.-C. Smart city governance evaluation in the era of internet of things: An empirical analysis of Jiangsu, China. *Sustainability* **2021**, *13*, 13606. [CrossRef]
13. Motwani, J.; Mirchandani, D.; Madan, M.; Gunasekaran, A. Successful implementation of ERP projects: Evidence from two case studies. *Int. J. Prod. Econ.* **2002**, *75*, 83–96. [CrossRef]
14. Panetto, H.; Cecil, J. Information systems for enterprise integration, interoperability and networking: Theory and applications. *Enterp. Inf. Syst.* **2013**, *7*, 1–6. [CrossRef]
15. Gonzalvez-Gallego, N.; Molina-Castillo, F.-J.; Soto-Acosta, P.; Varajão, J.; Trigo, A. Using integrated information systems in supply chain management. *Enterp. Inf. Syst.* **2015**, *9*, 210–232. [CrossRef]
16. Escobar-Rodriguez, T.; Escobar-Pérez, B.; Monge-Lozano, P. Technical and organisational aspects in enterprise resource planning systems implementation: Lessons from a Spanish public hospital. *Enterp. Inf. Syst.* **2014**, *8*, 533–562. [CrossRef]
17. Javidroozi, V.; Shah, H.; Amini, A.; Cole, A. Smart city as an integrated enterprise: A business process centric framework addressing challenges in systems integration. In *International Conference on Smart Systems, Devices and Technologies*, 3rd ed.; IARIA: Paris, France, 2014; pp. 55–59.
18. Halachmi, A.; Bovaird, T. Process reengineering in the public sector: Learning some private sector lessons. *Technovation* **1997**, *17*, 227–235. [CrossRef]
19. McAdam, R.; Donaghy, J. A study of staff perceptions and critical Business process re-engineering in the public sector. *Management* **1999**, *5*, 33–49.
20. Scholl, H.J. Current practices in e-government-induced business process change (BPC). In Proceedings of the 2004 Annual National Conference on Digital Government Research, Seattle, WA, USA, 24–26 May 2004; p. 18.
21. Araral, E. Why do cities adopt smart technologies? Contingency theory and evidence from the United States. *Cities* **2020**, *106*, 102873. [CrossRef]
22. Rainey, H.G.; Bozeman, B. Comparing public and private organizations: Empirical research and the power of the a priori. *J. Public Adm. Res. Theory* **2000**, *10*, 447–470. [CrossRef]
23. Boyne, G.A. Public and private management: What's the difference? *J. Manag. Stud.* **2002**, *39*, 97–122. [CrossRef]
24. Mouter, N.; Vonk Noordegraaf, D.M. Intercoder reliability for qualitative research: You win some, but do you lose some as well? In Proceedings of the 12th TRAIL Congress, Rotterdam, The Netherlands, 30–31 October 2012.
25. Bardach, E. *Practical Guide for Policy Analysis: The Eightfold Path to More Effective Problem Solving*; SAGE Publications: London, UK, 2011.
26. Bardach, E. Presidential address? The extrapolation problem: How can we learn from the experience of others? *J. Policy Anal. Manag.* **2004**, *23*, 205–220. [CrossRef]
27. Bozeman, B.; Scott, P. Bureaucratic red tape and formalization: Untangling conceptual knots. *Am. Rev. Public Adm.* **1996**, *26*, 1–17. [CrossRef]
28. International Electrotechnical Commission (IEC). *Orchestrating Infrastructure for Sustainable Smart Cities*; IEC: Geneva, Switzerland, 2014.
29. Lim, S.B.; Malek, J.A.; Yussoff, F.Y.M.; Yigitcanlar, T. Understanding and acceptance of smart city policies: Practitioners' perspectives on the Malaysian smart city framework. *Sustainability* **2021**, *13*, 9559. [CrossRef]
30. Jurisch, M.C.; Ikas, C.; Palka, W.; Wolf, P.; Krcmar, H. A review of success factors and challenges of public sector BPR implementations. In Proceedings of the 2012 45th Hawaii International Conference on System Sciences, Maui, HI, USA, 4–7 January 2012.
31. Nam, T.; Pardo, T.A. Conceptualizing smart city with dimensions of technology, people, and institutions. In Proceedings of the 12th Annual International Digital Government Research Conference on Digital Government Innovation in Challenging Times, College Park, MD, USA, 12–15 June 2011; p. 282.
32. Tomor, Z. The citipreneur: How a local entrepreneur creates public value through smart technologies and strategies. *Int. J. Public Sect. Manag.* **2019**, *32*, 489–510. [CrossRef]
33. Nah, F.F.; Lau, J.L.; Kuang, J. Critical factors for successful implementation of enterprise systems. *Bus. Process Manag. J.* **2001**, *7*, 285–296.
34. Zeffane, R. Patterns of organizational commitment and perceived management style: A comparison of public and private sector employees. *Hum. Relat.* **1994**, *47*, 977–1010. [CrossRef]
35. Buelens, M.; Van den Broeck, H. An analysis of differences in work motivation between public and private sector organizations. *Public Adm. Rev.* **2007**, *67*, 65–74. [CrossRef]
36. McAdam, R.; Mitchell, N. Development of a business process re-engineering model applicable to the public sector. *Total Qual. Manag.* **1998**, *9*, S160–S163. [CrossRef]
37. Scholl, H.J. E-government: A special case of ICT-enabled business process change. In Proceedings of the 36th Annual Hawaii International Conference on System Sciences, Big Island, HI, USA, 6–9 January 2003; p. 12.

38. Brorström, S. Implementing innovative ideas in a city: Good solutions on paper but not in practice? *Int. J. Public Sect. Manag.* **2015**, *28*, 166–180. [CrossRef]
39. McGuirk, P.; Dowling, R.; Chatterjee, P. Municipal statecraft for the smart city: Retooling the smart entrepreneurial city? *Environ. Plan. A Econ. Space* **2021**, *53*, 1730–1748. [CrossRef]
40. Purkait, S.; Das, S. Smart cities in India: Challenges ahead—ProQuest. *IUP J. Inf. Technol.* **2018**, *14*, 33–51.
41. Weerakkody, V.; Janssen, M.; Dwivedi, Y. Transformational change and business process reengineering (BPR): Lessons from the British and Dutch public sector. *Gov. Inf. Q.* **2011**, *28*, 320–328. [CrossRef]
42. Taylor, W.A.; Wright, G.H. Organizational readiness for successful knowledge sharing: Challenges for public sector managers. *Inf. Resour. Manag. J.* **2004**, *17*, 22. [CrossRef]
43. Yang, T.-M.; Maxwell, T.A. Maxwell. Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors. *Gov. Inf. Q.* **2011**, *28*, 164–175. [CrossRef]
44. Bretschneider, S. Management information systems in public and private organizations: An empirical test. *Public Adm. Rev.* **1990**, *50*, 536. [CrossRef]
45. Irani, Z.; Love, P. *Evaluating Information Systems: Public and Private Sector*; Butterworth-Heinemann: Oxford, UK, 2008.
46. Sotomayor-Gómez, B.; Samaniego, H. City limits in the age of smartphones and urban scaling. *Comput. Environ. Urban Syst.* **2020**, *79*, 101423. [CrossRef]
47. Liu, P.; Peng, Z. Smart cities in China. *IEEE Comput. Soc.* **2013**, *16*, 1.
48. Esposito, G.; Clement, J.; Mora, L.; Crutzen, N. One size does not fit all: Framing smart city policy narratives within regional socio-economic contexts in Brussels and Wallonia. *Cities* **2021**, *118*, 103329. [CrossRef]
49. Shaw, D.R.; Holland, C.P.; Kawalek, P.; Snowdon, B.; Warboys, B. Elements of a business process management system: Theory and practice. *Bus. Process Manag. J.* **2007**, *13*, 91–107. [CrossRef]
50. Christiansson, M.T. Improving Business Processes and Delivering Better E-Services—A Guide from Smart Cities. Smart Cities Project. 2011. Available online: https://pdf4pro.com/amp/view/improving-business-processes-and-delivering-better-e-services-3312ea.html (accessed on 17 March 2022).
51. Dalal, N.P.; Kamath, M.; Kolarik, W.J.; Sivaraman, E. Toward an integrated framework for modeling enterprise processes. *Commun. ACM* **2004**, *47*, 83–87. [CrossRef]
52. Momoh, A.; Roy, R.; Shehab, E. Challenges in enterprise resource planning implementation: State-of-the-art. *Bus. Process Manag. J.* **2010**, *16*, 537–565. [CrossRef]
53. Thomas, S. Understanding Current Processes and Bottlenecks before Reengineering Processes: A Case Study of Pilot Express. Ph.D. Thesis, Vanderbilt University, Nashville, TN, USA, 2020.
54. Zondo, D. The impact of business process re-engineering (BPR) on labour productivity in the automotive assembly organisation in South Africa. *Qual.-Access to Success* **2021**, *22*, 101–107.
55. Dufresne, T.; Martin, J. Process Modeling for e-Business, INFS 770–Methods for Information Systems Engineering. *Knowl. Manag. E-Bus.* **2003**, *1*, 1–28.
56. Lodhi, A.; Köppen, V.; Saake, G. Business process improvement framework and representational support. In Proceedings of the Third International Conference on Intelligent Human Computer Interaction (IHCI 2011), Prague, Czech Republic, 29–31 August 2011; Volume 179, pp. 155–167.
57. Hendley, R.J.; Drew, N.S. *Visualisation of Complex Systems*; School of Computer Science, University of Birmingham (UK): Birmingham, UK, 1995.
58. Viste, M.; Skartveit, H. Visualization of complex systems-The Two-Shower mode. *PsychNology J.* **2004**, *2*, 229–241.
59. Araujo, R.; Cappelli, C.; Engiel, P. Raising citizen-government communication with business process models. In *Handbook of Research on Democratic Strategies and Citizen-Centered E-Government Services*; IGI Global: Hershey, PA, USA, 2015.