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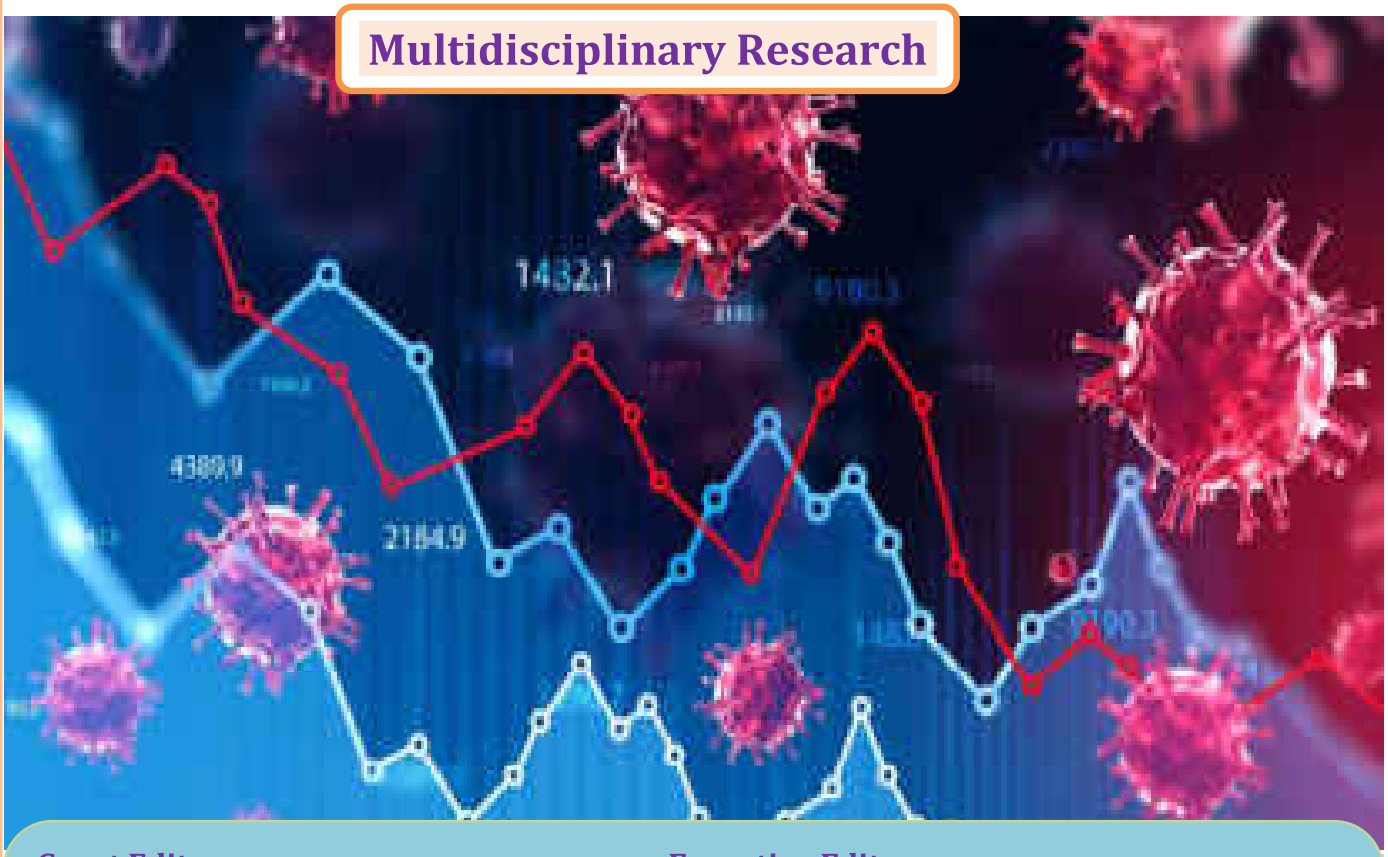

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An Introduction to Smart Libraries

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Abstract:

Will the Smart City give the public and academic libraries a new perspective? How will libraries be influenced by the smart city as cultural and scientific assets? And how are libraries able to contribute to smart city development? An analysis of recent library models, such as the Learning Center or the Green Library, shows a connation with the smart city concept, particularly with regard to the central role of knowledge and the integration of technology, people and institutions. The paper develops the outline of a new definition of the smart library from this observation, which can be defined in four fields, i.e. smart facilities, smart citizens, smart location and smart governance. The idea of the smart library, however, is not a specific model or project, but a system, a way of doing things, less linear, less organized, more imaginative and inventive. Smartness can also not be a cure for all library issues.

Keywords: smart library; smart city; library marketing; public library; academic library, *etc.*

1. Introduction:

There are many linked components in the general smart city models and concepts, such as industry and manufacturing, defense, healthcare , retail and shopping, electricity, waste management , green spaces, transport, home and even agriculture. Cultural and political components are also part of these models, along with schooling and higher education or, at a more abstract level, smart citizenship in society as a whole. They directly mention libraries occasionally.

Libraries can be described as social and technological-intellectual infrastructures, as essential components of a "larger network of public services and information institutions to which each library belongs." They encourage people to communicate, and they have the opportunity to become de facto community centers. They are a physical space, a nice place to go and spend a good time, friendly and relaxed, with locals such as workers, easily available, inexpensive or free. How will they contribute to an intelligent city?

Libraries are cultural and scientific institutions with collections, stacks of books, reading rooms, space for physical learning and interactive hubs for the consumption and development of information. In education and knowledge literacy, they play a role. They are cultural assets, one of the unique places where communal and human values are met by technology and even productivity. How will these assets affect the smart city?

In advocacy and marketing, libraries have a problem. People have been debating the future of the library for almost forty years now. Some of them also foresee the end of the library, unable to cope with the digital age and social change, unsustainable, some form of Gutenberg era vintage; they "may vanish like the dinosaurs" after reaching an impasse. Will a new insight be given by a smart city?

Will technological growth lead to the conventional library's decline or "major alteration"? The "peak of wisdom" is this? One thing is certain: for the future growth of libraries, the evolving urban climate of information technology and connectivity, mobility, digital nomads and

local communities is of great importance, and libraries must propose creative solutions if they are to remain in the game. In other words, the smart city challenge should be perceived by libraries as an opportunity, not as a threat. This is our paper's topic: how can library management capture the smart city opportunity? In this new infrastructural setting, how can the library be redefined? How does the smart city's model influence the library's understanding? And what would constitute, in this context, a new smart library concept? [1]

2. Recent models for the creation of libraries:

Library and information science has developed new concepts for the marketing and advocacy of public and academic libraries in the face of new social and technical challenges. Some of these principles had an influence and were successful as they influenced a new generation of libraries' core principles, mission and vision statements. For another cause, they are also relevant: the key components have affinities with the smart city's core features. [2]

2.1. Information commons:

The idea of successful collective ownership and resource management has been extended to libraries in the sense of social media, focused on the exchange of information in online communities and opposed to profit-dominated markets with their particular types of enclosure. Commons are services or facilities owned by producers or consumers' groups. Collaboration, cooperation, networking, shared governance and non-profit business models are their fundamental concepts. Participation and exchange, not rarity, decide the worth of the capital. "Information exchange is part of libraries' core values: "The interest of librarians and other information staff is to provide library users with the best possible access to information and ideas in any media or format (...). The ideals of open access, open source and open licenses are advocated by them.

In library sciences, basic resources and methods, such as library-based open access journals and free access digital libraries, as well as the underlying core values and organizing principles, such as transparency, unlimited access and non-discrimination, non-profit and so on, have been defined by the term knowledge popular. As a public institution, libraries build on the engagement of local or academic communities and on the security of freedom of intellect, i.e. freedom of speech and information.

For almost 15 years now, Knowledge Commons has been (and still is) a strong term for the marketing and promotion of public and academic libraries. Public libraries in the UK have been turned into concept stores with numerous opportunities for learning, knowledge, entertainment and culture. With regard to smart cities, the connation is made up of two elements: the society, and the services and facilities shared.

2.2. Learning centers:

Other models have arisen to improve the attractiveness and efficiency of academic libraries on campus, such as learning commons, media commons, and, above all, learning centers. "Such models move the focus of the library away from holdings and silent reading, to modular learning environments, smart technology, and features that position students at the center of the library" great good location. The spotlight is on learning. Pedagogy has become a major driver of library design that should promote autonomy, self-monitoring and personal information management-based learning processes. Some of them incorporate elements from spaces for creativity and co-working.

A significant function is played by design and architecture. With its space, what should an academic library do? What kind of architecture, physical setting, and technological equipment is ideally suited to help and enhance the standard of learning for students? Sharing resources and services are again important components of the idea. The attention paid to use, experience, learning and cognition, and the role of social and mobile technology are other interesting aspects.

2.3. Green libraries:

How does the library help to safeguard the natural environment? Libraries are comparatively clean compared to power plants, the chemical industry or road transport, and their carbon footprint is less than a coal plant or blast furnace. Yet, libraries consume water and electricity, buy chemicals and create waste. Like every other operation, environmental and emissions issues are of interest to them. The idea of the green library aims to provide a response to the environmental challenge.

The green library model provides the basis for a wide variety of activities to minimize waste, recycle, conserve resources and so on.Some acts are related to new buildings or major upgrades (green roof); others (use of energy efficient light bulbs, paper recycling) may be introduced at any time. Education, awareness raising and activism, and access to advanced knowledge are other levels of intervention. In addition, the model offers checklists and guidelines for the assessment of the ecological effects of libraries. The green library model is not limited to academic libraries, but is applicable to libraries of all kinds. Buildings and "clean" technology and facilities play a key role, but they are rooted in education , training and regular environmental action. The model also brings into the area of library sciences the notion of sustainability. [3]

2.4. Universal library:

As the Green Library model focuses on environmental issues, the definition remains somewhat reduced, at least as long as it does not cover other aspects of sustainable development, as specified by the United Nations (Agenda 21) and other international bodies. Libraries are cultural institutions that facilitate education and science, but they are more than that; they are often part of the local community, often as a kind of social agency; they are potential contributors, like any other organization, to the sustainable development of society and humanity, and within this context they should be evaluated. This implies that a comprehensive approach ('global library') should be built in library management and marketing and the concepts of corporate and organizational social responsibility should be tailored to the unique context of public and academic libraries.

2.5. Confluent features:

Commons of knowledge, learning centers, green and global libraries are different solutions to the same technical and societal challenges. Their principles provide mechanisms for library marketing and management. They express the conviction that the existing background provides ample opportunities for the future growth of libraries and that libraries have the capacity and versatility to adapt and function as 'opportunity institutions'. Seven convergent characteristics can summarize the power of these models: [4]

- In an ecosystem of information institutions, epistemic framing is a cultural infrastructure.
- The deep group connation and the attention paid to the wishes, attitudes, perspectives and knowledge literacy of the users.

- Attention was given to the institution's social and societal effect, with new social functions (social responsibility).
- As requirements for strategic decisions, concern for sustainability and environmental problems.
- The ideals of exchanging wealth, cooperation, networking, and transparency.
- The value of innovations those are revolutionary.
- The building's vital function.

A new and original conceptual environment for the creation of library programs, organizational structures and functioning is generated by these convergent features. There are also clear affinities with the idea of the smart city in contrast with the recent development of urbanism. A new, inclusive approach to library science can thus be provided by the smart city.

3. Closeness with the smart city:

Instead of a straightforward framing or one-size-fits-all term, the smart city has been described as a "local labeling" phenomenon, a "fuzzy idea." In the same way, the smart city has been defined by other writers as a vague, generic and ambitious "city of the future" concept, intended primarily as a "effective, technologically advanced, green and socially inclusive city."

"The word" smart "has been associated with many definitions and connotations, e.g. effective , sustainable, egalitarian, livable, instrumented, interconnected, intelligent community:" The use of Smart Computing technology to render a city's critical infrastructure components and services (...) more intelligent, interconnected, and productive (...) A city that provides inspiration, shares cultures, information, and services (...) This assemblage of 'pre-existing urban imaginaries' is not the relevant point for the creation of public and academic libraries. Two elements are of importance.

3.1. The focus on information:

A plethora of information-centric services willing to connect with each other, as an ecosystem for information exchange, collaboration, interoperability and seamless interactions, have defined smart cities as a "ubiquitous digital eco-system." Technology makes the city smart; people ("smart community") create awareness through information and communication systems that "enhance freedom of expression and access to public information and services." Libraries are part of the information eco-system; they are technical and intellectual infrastructures that provide access to information, collect information, collect information. [5]

3.2. A multiextentapproach:

Even if the smart city's key components are digital infrastructures and disruptive technology, the technical scope of the definition is rooted in a wider context, i.e. the human and institutional aspects. There is more to the smart city than ICT and linked objects. It relies on "intangible assets" innovation, intellectual and social resources, and it requires governance, policy and regulations, i.e. deliberate decisions "to use the technology to change life and function (...) in significant and meaningful ways." Technology is the central scope, but the smart city is not created by technology alone. As a psychologist might claim, people make the city and the smart peep.

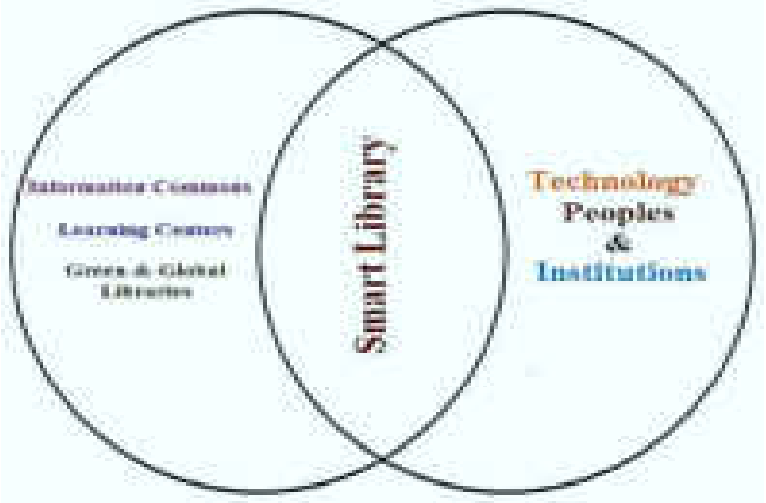

Figure 1.At the interface between library principles and the intelligent city, the smart library

3.3. Around a new model:

The idea of the smart city makes both aspects, the emphasis on information and the multi-externality, attractive for library growth. A few studies , especially from China and India, have introduced the idea of a smart library since 2013. The concept was used in a non-consistent fashion, however, and based on technology and associated job skills. They concentrate mainly on RFID, the Internet of Things and connected objects, mobile devices, infrastructures and Big Data, including the (interesting) Smart Libraries Newsletter published by the American Library Association. The social and human aspects, the "soft" realms such as life, government , economy and citizens, are given less attention.

However, it is above all the human reach of the smart city that makes the idea appealing to libraries, i.e. the function and growth of innovation, education, learning and information (figure 1). The European Conference on Information Literacy (ECIL) in 2015 proposed an inclusive and multi-scale definition of a smart library, in which Adam Sofronijevic and his colleagues from the University of Belgrade identified the transformation of public library services into a "smart people's information literacy center" in a "city that has changed and become smart and more sustainable." Another study highlights the provision of explicit knowledge as an indicator for the "data" of a city through digital libraries; digital libraries provide a "additional universal knowledge service" at the city level. The following section will provide some complementary insights into this new term and explore its potential as a useful label for public and academic library growth. [6]

4. Extents of the smart library:

Smart city projects are a mixture of hard domains (natural and energy resources, transport and mobility, buildings) and soft domains (living, government, economy and people). For example, Giffinger et al. ranked 70 medium-sized European cities on six main axes of innovation, i.e., smart economy, smart mobility , smart climate, smart citizens, smart living and smart governance. This holistic approach combines technology, individuals and organizations with "smart features." In fact, however, hard and soft domains are often divided, and more attention is paid to hard domains, especially transport and natural resources, than to governments

and individuals. "Most municipalities and their suppliers of technology primarily concentrate on technology, not individuals."

A double error is expressed by such a "smart plan". Not only does it ignore smartness's fundamental essence, i.e. "smartness is based on a consumer viewpoint," but it also practically marginalizes soft realms that are important and important to people and their quality of life.[7] For the library, what does this mean? A library tends to have more affinities with the soft realms, with people and with living as an institution of culture and education, as a popular knowledge as well as a third location. The smart city is built to promote the nurture of information and creativity in its position as a "learning city" or "technology city." Adapting the well-known meaning of Giffinger et al., one might claim that as an knowledge center, providing access to information and enhancing information literacy, a smart library performs well in a forward-looking way; the term refers to the search and identification of intelligent solutions that enable modern libraries to improve the quality of the services.

The definition of a smart library has a double character: it enables some basic innovations and realizations in public and academic libraries in urban settings and on science campuses to be represented consistently. It can also contribute to tomorrow's libraries' fresh and dynamic vision, helpful in identifying priorities and strategies for getting there and helpful for library promotion and advocacy, too. It may be useful to distinguish four fields, i.e. smart facilities, smart people, smart location and smart governance (Figure 2), for the definition and creation of smart libraries.

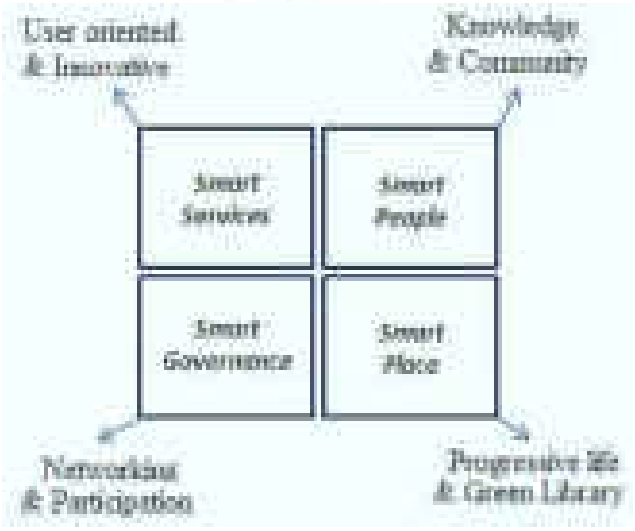

Figure 2. Four extents of the smart libraries

4.1. Smart services:

First, the application of the "spirit of creativity" of smart cities to the creation of modern library services can be identified. Smart library papers also concentrate on this degree and present technical advances such as smart services such as RFID, mobile and wireless connectivity, remote assistance, semantic web, artificial intelligence, the Internet of Things, machine translation, recognition of voice and image, processing of natural language, virtual reality to provide new cultural heritage experiences, etc.

Some papers define smart library services as ICT systems based on libraries, document search, retrieval of information, collaborative collection building, etc. Interoperability and

interconnection with other information systems is another feature of intelligent library services. [8] In a broader knowledge ecosystem, a smart library is a knowledge center connected to other libraries and community services.

These creative tools and services, however, are only intelligent to the degree that they are user-friendly and user-centered. Smartness implies that the development of new tools and services is based on the evaluation of actual use. The library is described by the user. "More user-friendly than intelligent is smart." Instead of attempting to accommodate the user to current library facilities, smart libraries need to be tailored to the needs of the user. In order to promote smart mobility, use of library space and access to library services, agile management, UX design and customized knowledge discovery based on recommendations (algorithms), the measurement of actual use can include mobile crowd sensing.

4.2. Smart people:

Smart libraries are designed for smart people, and with them. Smart library services are not only user-friendly and user-centered, they are also based on the smart library user's vision or assumption as an active (co) knowledge creator and not as a passive consumer of information. In terms of versatility, innovation, openness, cosmopolitanism, empowerment and engagement in public life, people in smart cities are identified. As human and social resources (assets), their level of qualification is respected and services are needed to contribute to the growth of these features and skills.

In the specific library context, this definition of smart people can be interpreted as follows on two levels: Smart community: in fact , the concept of smart people involves not only the smart person, the consumer of smart library services, but also the library staff, their skills and job growth. For example , when it comes to the creation and processing of knowledge and data (data librarian) or to the management of discovery resources, the library staff is part of the smart people. Knowledge production: The user of the library is a knowledge creator, or co-producer, along with other users and/or employees. Other words defining the vision of the function and behavior of the user of the smart library are development, enrichment, exchange of information and knowledge. The conceptualization of the library as a "platform of the commons" where information is created by and with people converges with this vision.

Tomorrow, maybe, more than ever, the library will be a place of life, of encounter, of liberation, of artistic and science education, of reading, music, theatre, exhibits, cafeterias, fables, etc. Mediation and more, e.g. facilitation, assistance and co-production, will be the primary library feature tomorrow. [9]

4.3. Smart place:

The third measure relates to the library as a building and as a venue. This scope can be described in a general way as "smart environment" and environmental monitoring. In reality, there are two different aspects that we can discern. The first element is ecological and comparable to the previously described idea of the green library. For example, it covers compliance with sustainable building rating systems, waste management, natural environment attractiveness, lack of pollution and sustainable resource management, etc. Sustainable architecture and engineering form one component. Ecological functioning and management is the other one. Together, they reflect the contribution of libraries to sustainable biodiversity and growth.

The second aspect can be defined as building-related smart living and means, for example , building monitoring and control, electrical system monitoring, personal safety and a healthy environment for both employees and the public. This aspect involves developments that lead to enhancing the library's quality of life and appeal as a building and as a venue. As a third location, with its architectural style, working, etc., we can see parallels with the "hard" qualities of the library. This third stage of the "smart place" incorporates the creative attributes of the green library and the "third place library" and explains the transformation of the conventional building and operation of the library into a smart place that contributes as much to the city's smartness as to sustainable growth. [10]

4.4. Smart governance:

The smart library's last stage is structural and democratic. It includes all library features that relate to the "smart governance" concept in the community, which encapsulates, for example, collaboration, cooperation, partnership, involvement of people, and participation. The group, which recognizes the potential of information technology for library growth, is at the center of smart governance as a means of reinvesting libraries into a new ecosystem. "For the success of smart city cities, institutional preparedness and community governance are important." Again, there are two things we can discern.

Smart management: Smart library management can include many initiatives such as growing administration and management system accountability, user engagement in decision-making processes, automated and optimized management procedures, real-time analysis of big data on library usage to enhance library strategy and decision-making efficiency, etc. The customer of the library becomes a library stakeholder and takes part in the management and administration of the library.

Smart networking: networking, or, in other words, library transparency and embedding in its social and cultural climate, is the second element of smart governance. Decisions should also be made collectively, not as an individual agency, but as an aspect of other libraries, information hubs and third places in the greater ecosystem. Collective knowledge, focused on mutual roles between library staff, the library community and other organizations, is the key word for smart governance. "A crucial success factor in gaining potential momentum in public policy would be mutual coherence." One way to improve social coherence is smart governance. In several ways, public libraries can contribute to local policies by contributing to culture and education, filling the knowledge literacy gap and enhancing access to relevant information and social services. [10]

7. Conclusion:

Will the Smart City give the public and academic libraries a new perspective? How will libraries be influenced by the smart city as cultural and scientific assets? And how are libraries able to contribute to smart city development? Recent models of public and academic libraries, such as the Learning Center or the Green Library, have shown a number of parallels to the smart city concept, particularly with regard to the central role of information and the integration of technology, people and institutions.

We developed the outline of a new definition of the smart library from this observation, which can be defined in four fields, i.e. smart services, smart citizens, smart location and smart governance. As for the smart city, the smart library idea remains "fuzzy", accessible, and diverse

in some way. The idea of a smart library is not a specific model or project, but a method, a way of doing things, less linear, less organized, more imaginative and inventive. The idea does also not extend to all libraries. Smartness cannot be a solution to all issues in the library. The idea of the smart city, however, provides an opportunity for some libraries, at least, to prove their social importance. Not all libraries are going to (should) become wise. But some libraries, in the city or on campus, need to adapt to the evolving intelligent environment.

Libraries have to re-invent their role and work in the new ecosystem in a world where knowledge has become ubiquitous. They may not have an exclusive monopoly on access and management of information, and other entities and systems can and will externalize and fulfill some of their information functions and roles. It could be that the future library is very different from what we see today. For buildings that contain many of the essential functions of a (...) library but which have a different focus character, perhaps "a new name is needed." Our concept is that "smart library" could be one big candidate for this new name in the urban setting and on the university campus. Traditional marketing means no service without clients. Setting this law on its foot, we'd rather say that there are no smart people without smart services. In the forthcoming smart society, the smart library is an opportunity to remain in the game and protect the fundamental library properties as a "civic landmark."

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