Literature Review: Technologies and Property Development

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Abstract. This literature review was conducted to provide an explanation about technology in property development process. The knowledge on technology is important for property developer to remain competitive in property industry. If a property developer does not understand about technology in property development process, they will likely be out of business. Information related to technology in property development hasn’t been widely discussed, thus it may be difficult for novice property developers to join the industry. The method of this study is literature study. There are three technologies in the property development process, namely Property Technology, Financial Technology and Construction Technology. Most authors explain more about financial and construction technologies in property development. Most authors are unable to separate Property Technology from Financial Technology and Construction Technology. Only a few of them have critical way of thinking in relation to the definition of Property Technology which leads to innovation and bring about revolution in its development. There are rooms for learning on the Impact of Property Technology that change the property development process.

Keywords. technology, property, infrastructure, development, IoT

1. Introduction
Technology is very closely related to all production processes and everyday life. Technology can help, improve performance, and speed up the process of developing a product, especially the process of property development that requires a long and complicated process. Developers need to understand technology in property development if they want to compete in the property sector. The use of technology can trigger a change in the development process and improve the quality of work. Developers that are unable to use the technology in their development process will be left behind.

Considering the advantage of technology and how it will change the property development process, an explanation about the use and function of technology in the property development process is important for developers. In relation to Smart City, the city’s growth is currently driven by property and infrastructure development, which are driven by the property developers. Because of that, it is important to know how the technologies influence their works and what the current development process is. This is important if we want to understand how to improve smartness and increase the use of technology that changes the process of property development. Most of the literature in the property development process explains more about construction technology and financial technology while there are other technologies namely property technology. Today’s literature rarely talks about property technology and the differences between other technologies.
2. Methods

This study used qualitative methods through the study of literature on property development, and technology in property development. First, we conduct a study of the property development process from a practitioner's and theoretical perspectives. There are 11 literature about the property development process that are used as a basis for mapping the scope of technology. The perspective of the literature regarding the property development process can be known through (1) the author's background and (2) the author's purpose in explaining the property development process.

Six literatures explained theoretical property development from 11 literatures. These six literatures are written from the author's experience in the academic field and based on the study of literature. The other four literatures describe the practical process of property development based on experience in the property field and research on practices in the property industry.

First, the literature about the property development process used for the basis for evaluating the scope of technology. Second, study the literature on property technology used to determine its application and impact. Third, the study of financial technology and construction technology used to separate the role of technologies. Knowledge from the property development process, property technology, financial technology, and construction technology is used for mapping the scope of each technology. This literature study showed us opportunities for further research related to technology in the real estate industry.

3. Literature review

3.1 Property Development

The function of property development is to improve land functions and to regulate and change land. Property development varies, such as landbanks, land packaging, building development, renovation, operation, and redevelopment. Each property development process has similar steps starting with initiation and study. Landbank is a process of acquiring for development within a certain period of time to increase land value. Developers can increase the value of land by changing land functions and by making land development plan and site study. These endeavors are called land packaging that regulates land functions based on their potential. Developers need to make building development which requires them to transform the land function into property products that can be used or inhabited. It can be achieved through renovation. Renovation is the process of increasing the value of property products that have depreciated by repairing or changing the quality of buildings. The last property development is the redevelopment of an existing property by changing its property functions according to the potential that has been analyzed.

There are numerous stages in the property development process where each stage needs to be completed to reach the next stage. The process of property development is like a game [1]. Property development will produce a property product if the developer can complete a series of stages. If the developer fails to complete a certain stage then they need to return to the previous stage and evaluate it. Each stage has its own risks and benefits for developers and the environment. Property development is a process that connects components and knowledge to produce property products.

There are two approaches to the stage of property development explanation based on the perspective of the authors. The first approach is theoretical approach by the academics and literature [1–6]. The second approach is practical approach by practitioners in the property sector [7–12].
The practical explanation of property development phase is more straightforward than the theoretical explanation because the theoretical approach tends to be longer and more complicated since it separates each task in one stage. Both approaches differ in the sequence or chain of development processes. Theoretically, the stage of property development is arranged separately according to the tasks. Practically, several tasks that are interrelated and can be carried out together will be included in one stage. Some author who explained the development process from the practical point of view, argue that the process of initiating, studying the land, and studying the market in the development process is included in one stage \([7,11,12]\). These three tasks cannot be separated because they are interconnected and can be done in parallel. These three tasks included in the stage of determining land \([7]\) while another author called it the pre-financing stage \([11]\).

The practical and theoretical explanation also differ in the construction and post-construction phases. The construction phase in practical explanation is a process of building property product. In the theoretical explanation, the construction phase is the process of realizing all planning in the previous phase. Theoretically, property development is a process in increasing the value of land realized by producing property products, utilities, and infrastructure for access. The post-construction phase is the

| Table 1. Property development Process. |
|---------------------------------------|
| Reference | [7] | [10] | [5] | [9] | [12] | [2] | [4] | [3] | [6] | [1] |
| Idea | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Site study | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Site selection | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Market study | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Site Acquisition | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Feasibility study | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Design | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Planning | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Financing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Permits | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Negotiating contract | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Commitment | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Implementation | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Construction | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Promotion | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Exit Strategy | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Property Management | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
stage of determining whether the property would be sold or leased [1,3,5–7,10–12]. Theoretically, developers do not only think about sales or leasing in the post-construction phase but they also think about the management of property products if they manage it by themselves. There are three options in the exit strategy stage, namely leasing, selling, and operating property products, therefore that there is still a stage of property management in the post-construction phase.

The property development process consists of 16 stages namely initiation, land analysis, land selection, market study, land acquisition, feasibility study, design, planning, financing, licensing, contract negotiation, commitment, implementation, promotion, project completion strategies and property management (table 1). Table 1 separated each stage which are described by practitioners and academics then combined them to become a series of development processes. Sixteen stages were divided into three phases namely the pre-construction, construction, and post-construction phases. These three phases were sorted by development time.

3.2 Technology in Property Development Process

There are three types of technology that can be applied in the property development process; (1) Property Technology, (2) Financial Technology, (3) and Construction Technology. These three technologies have their respective roles in the development process to become the supporting tool for the property development process to increase efficiency, effectiveness, and quality. Aside from that, they can change the process of property development. It is important for property developers to know and understand the usefulness of each technology.

3.3 Property Technology, Financial Technology, and Construction Technology

There are two ways to explain the meaning of Property Technology. The first explanation sees Property Technology, or more commonly known as PropTech, as a support tool. PropTech is the use of methods, techniques, and tools that help in the property sector [13–18]. This statement gives the meaning that technology is able to ease work, improve efficiency, and work effectiveness. This meaning sees innovation as an outcome which is characterized by the efficiency and effectiveness of the process [19]. The second meaning is Property Technology as a technique, method, device that can change the process of property development [20–22]. This meaning sees innovation as a process which is characterized by a change in the product development process. Property Technology is a technology that innovates property development in terms of processes, services, management, and business models.

The benefits of using various property technologies are related to increasing benefits for the consumers and the property developers in the property sector [22]. There are opportunities and risks in the use of Property Technology [15]. Property Technology is able to provide opportunities for developers to get investors and also to increase actor participation in the property development process. However, there is a looming threat of failure that will give extra pressure to the developers who use Property Technology if they do not experience increased performance and innovation with Property Technology.
Some of the authors see Property Technology as startups that have business models and new ways of offering products in the property sector [17,21]. The company, which is called Property Technology, usually uses innovative tools or methods in mediating the process of product marketing and communication with consumers. Companies that claim their companies as Property Technology usually have this technology that can provide an easy, precise, and effective way of managing and offering services. There are too many explanations of the meaning of Property Technology so there is a shift in the meaning of this term.

**Table 2. Category of Property Technology**

| Property Technology Category | Management System | Product Search | Documentation | Property Insurance | Shared Economy | Smart Real Estate | Property Investment and Financing | Property Service |
|------------------------------|-------------------|----------------|---------------|-------------------|----------------|-------------------|-------------------------------|-----------------|
| [23]                         | √                 | √              |               |                   |                |                   |                               |                 |
| [24]                         | √                 | √              |               |                   |                |                   |                               | √               |
| [13]                         | √                 | √              |               |                   |                |                   |                               |                 |
| [14]                         | √                 | √              | √             |                   |                |                   |                               | √               |

Some authors explain the category of Property Technology (table 2) [13,23,24]. These categories are arranged based on their functions in the real estate sector. All these categories have similarities that can be mapped in technology groups that offer data, transactions, and management, services, and controls. Technology in data groups are technologies that helps in storing, retrieving, managing and visualizing data. Property Technology in a group of transactions is the use of technology that facilitates the process of exchanging products, and services in the property sector between providers and consumers. Property Technology in the management, service, and control groups is the use of technology in the management, control, and procurement of services in the property sector to improve the performance of property products. Property Technology in the third group is very helpful in the management process on the post-construction phase.

Financial technology is one of the technologies that plays a role in the process of property development. Financial Technology is closely related to Property Technology because the development of Property Technology 2.0 is driven by the existence of technology in the transaction process. The second phase of Property Technology development is characterized by the presence of financial innovations in the property industry that allows easier transactions with lower costs. At the beginning of its development, the two technologies were equally encouraged by the presence of computers in 1990.

Financial technology is a technology used in the financial sector that encourages systems that model, assess, and process financial products [25]. For example, crowdfunding becomes a new method or model as a financing system for a product. Financial Technology helps speeding up the process of transactions or those related to finance, as well as the experience of consumers and providers of products that use said technology [26,27]. Financial Technology can encourage the development of business models and offer new methods in the financial sector, especially in the property industry.
Table 3. Category of Financial Technology

| Financial Technology Category | Crowdfunding | Financial Information | Payment system | Lending system | Trading system | Insurance | Wealth Management | Capital Market | Money Transfer | Financial Exchange |
|-------------------------------|--------------|-----------------------|----------------|----------------|----------------|-----------|-------------------|----------------|----------------|-------------------|
| [23]                          | ✓            | ✓                     | ✓              | ✓              | ✓              | ✓         | ✓                 | ✓              | ✓              | ✓                 |
| [25]                          | ✓            | ✓                     |                | ✓              | ✓              | ✓         |                   | ✓              | ✓              |                   |
| [26]                          | ✓            | ✓                     | ✓              | ✓              |                | ✓         |                   | ✓              | ✓              |                   |
| [27]                          | ✓            |                       | ✓              | ✓              | ✓              | ✓         |                   | ✓              | ✓              |                   |

Financial Technology has ten categories based on the facilities offered (table 3) [23,25,26]. Crowdfunding is a method of financing a product, project, and others by collecting investors who are willing to contribute. It can work because Financial Technology is able to attract investors to make products, ideas, and capital investment [27]. Financial information category is a technology that helps to find and display financial data or how to use financial products to consumers, investors, or other users of financial products. The data search function is offered in the category of financial information such as transaction activity data, financial procedures, lessons on how to conduct transactions [25,26]. The payment system category is a Financial Technology that facilitates the process of exchanging a product, service, or financial asset with a faster way, lower cost, flexible, without intermediaries, and appropriate to the public. The lending system category is a technology that helps financial service providers in providing loan services to consumers and lending management. The trading system category is part of Financial Technology that facilitates sales service providers or offering their products and mediate between developer and consumers to make transactions at different times and spaces [25]. The trading system category is not only applicable to the property sector but also to other sectors that have a system of selling, renting, and buying. The insurance category serves to secure financial assets and transactions. Personal finance category or wealth management is a Financial Technology that helps consumers, investors, corporations in managing finances, such as making the right financial decisions and investment. The capital market category is part of Financial Technology owned by financial institutions to carry out their activities and services. The money transfers category facilitates the transfer of funds between individuals or institutions indirectly without the need for a face to face meeting. Financial Technology facilitates a process that allows to digitally record and move assets on a network without an intermediary through a distributed database included in the category of financial exchange [23].

Construction Technology is a part of the technology that helps the process of implementing property development planning. Construction Technology helps development activities in terms of data, physical, and service [28]. Construction Technology plays an important role in data categories as a tool for sending data, recording data, assessing productivity, sharing planning data and reports, representing data, and communicating between development actors. Construction Technology as a tool and equipment in the realization process of property development in the field such as machinery is included in the physical category. Service category of Construction Technology includes work safety insurance, security, and maintenance.
3.4 Intersection in Technology

Financial Technology is considered as a good guide for Property Technology activities [23]. Property Technology and Financial Technology are concurrently developed and mutually influence each other, thus blurring the line between them and confusing many people, especially in the real estate industry. The main factor of this confusion is the second phase of Property Technology development or Property Technology 2.0 [23] that is triggered by the emergence of technology in the system of lending, payments, financial management, money transfer, and capital markets in the property sector. It expands the scope of technology in property development. This is actually a part of Financial Technology in the property sector. Some authors tend to see all technologies in the property sector, especially in property development, as Property Technology, therefore allowing an overlap definition of technologies in the process of property development. Some Property Technology categories described by some authors [13] [14,24] actually fall into the category of Financial Technology.

| Table 4. Property Technology and Financial Technology |
|------------------------------------------------------|
| Data (information) | Transaction | Management, Service, Control |
| Property Technology | [13] [14] [23] [24] | Property management |
| Commercial real estate search | Property investment and financing |
| Long-term rental / sales search | Property brokerage and leasing |
| Indoor mapping | Portfolio management |
| Life, home, property and casualty insurance | Property insurance |
| Real estate agents tools | Shared economy |
| Shared economy | Property management |
| Shared economy | Project management |
| Portfolio management | Home services |
| Commercial real estate search | IoT home |
| Long-term rental / sales search | Digitizing administrative management |
| Indoor mapping | Smart building |
| Life, home, property and casualty insurance | |
| Real estate agents tools | |
| Shared economy | |
| Property Management | |
| Service | |
| Control | |

Financial Technology | [23] [25] [26] [27] | Insurance services |
| Education Lending | Personal finance/wealth management |
| Payment system | |
| Trading system | |
| Financial exchange | |
| Lending | |
| Institutional/ Capital markets | |
| Money transfer | |
| Bitcoin | |

Property Technology and Financial Technology have different categories but they have similarities when we map based on data, transactions, and management, service, and control. The differences can be seen in how Property Technology offers search, display, data processing related to development and real estate products such as home rental and sale searches, site studies, and more. Meanwhile, Financial Technology offers search, management, visualization of data or information related to financial products and field such as loan procedures, customer data, and others. The same thing happened in the management, service and control groups. Property service providers, property operators, and other property actors are helped by the technology that can mediate their work in offering services, managing, and supervising property products with Property Technology in the management, service and control.
groups. Some categories of Property Technology in the transaction group are the same as Financial Technology. Some categories of Property Technology in the transaction group are Financial Technology in the property sector.

Most Property Technology in the transactions group is a part of Financial Technology because due to its similar function (table 4). For example, Property investment and financing are technologies that help to make payments and funding for property products that use a payment system. Brokerage and leasing property is a technology that helps to offer property products even though in reality most of this technology uses a trading system and a payment that helps consumers transact with property developers. This trading and payment system is included in Financial Technology. With this in mind, we can see that there is an intersection between Property Technology and Financial Technology in the property sector called Real Estate Fintech.

Fintech Real Estate is a Financial Technology in the property sector. This intersection between Property Technology and Financial Technology has caused confusion regarding the use of Property Technology and Financial Technology terms. Some authors have begun to separate the scope of Property Technology, and Financial Technology based on their uses [13,23]. The mapping of technology categories in table 5 is done to separate Property Technology, Financial Technology and Fintech Real Estate. The purpose of the mapping is to avoid any more mistake in using the term of technology. Property Technology, Financial Technology, and Real Estate technologies are different technologies and separate technologies.

Real Estate Fintech is a technology that mediates the process of selling the ownership of property assets [23]. Exchanges or transactions that occur in Fintech Real Estate activities are not only related to property assets but also to real estate services. Examples of Fintech Real Estate Services are portfolio management and property finance loans. One example of Fintech Real Estate technology is an Android-based application owned by Airbnb that helps to offer rental facilities and transaction. Consumers and property owners can communicate by the application and make transactions without the need to meet face to face. Some of the products offered in the Airbnb application have a shared use system that is categorized as a shared economy so there is an overlapping technology used in it. Airbnb application is a technology as a device and also as a technical revolution in the management of property products.

| Table 5. Property Technology, Real Estate Fintech, and Financial Technology |
|-----------------------------|-----------------------------|
| Technology                  | Category                     |
| Property Technology         | Data Search                  |
|                             | Real estate Documentation    |
|                             | Real estate Service          |
|                             | Real estate Management (Shared economy, and Smart Real Estate) |
| Real estate Fintech         | Property Crowdfunding        |
|                             | Property Payment system      |
|                             | Property Lending system      |
|                             | Property Trading system      |
|                             | Portfolio Management         |
|                             | Exchange system in Real Estate |
| Financial Technology        | Crowdfunding                 |
|                             | Financial Information        |
Payment system
Lending system
Trading system
Wealth Management
Capital Market

The categories in Real Estate Fintech are crowdfunding, payment systems, lending systems, trading systems, management systems, and exchange systems. Crowdfunding category is a technology that helps in the process of funding, financing, capital, and property investment. The payment system category is part of Real Estate Fintech which is often applied in transactions process in management, sales, rental of property products, property services, and property insurance. The lending system is a category of Real Estate Fintech that helps in the process of acquiring ownership rights to property, financing and investment assets by offering funding opportunities on a regular basis. The trading system category is Real Estate Fintech which facilitates the bidding process that offers property products to the public. This category is often used by property agents and property developers. The management system category in Real Estate Fintech helps to provide funding investments options in the property sector such as portfolio management.

Some authors [13,22] do not separate the scope of activities between technologies both Property Technology, Financial Technology, Construction Technology, and Real Estate Fintech, thus making it difficult to tell them apart. It would be easier to distinguish between Property Technology, Financial Technology, and Real Estate Fintech with a mapping based on their functions as in table 5. In property development practices, Property Technology is more helpful in the study, analysis, and management of property assets. All innovations in terms of technology related to financial transactions and funding are included in Financial Technology. This transaction and funding process applies to other sectors not only in the property sector. Construction Technology helps more in the implementation of construction planning and management.

Technology in property development is very difficult to distinguish based on types and technology distribution mediums. Property Technology, Financial Technology, and Construction Technology can be distributed through software and hardware. Financial Technology and Property Technology have a close relationship and can be mapped based on data, transactions and management, service and control groups. An easy way to separate the three technologies is through mapping the scope of their activities into the property development process.

3.5 Mapping the technology in property development process

There has not been much explanation about the scope of technological functions in the process of property development. Technology in the property development process divided into three parts, namely technology as input in production, technology with functions of operation and construction, technology with the function of management [18]. The first technology group helps in the process of finding data, analyzing, and processing data. The second one is a technology that helps structural development processes, property products, and financing. This technology also helps in the management and operation of the development process. The third category helps in the operational process of real estate products.

There are other technology groups that play a role in distributing property products to consumers based on the functions and categories of Property Technology, Financial Technology and Construction Technology described in point 2. These technologies play an important role after the planning stage is completed and the property products are ready to be marketed to the public. Technology that helps in the promotion process and the introduction of property products is called technology with the function of property marketing and transactions so that there are four technology groups in the process of property
development. The four technology groups are technology as input in production (T1), technology with the functions of operation and construction (T2), technology with function of management (T3), and technology with the function of marketing and transaction (T4). The four technology groups describe Property Technology, Financial Technology, and Construction Technology so that we can map these three technologies into it.

The four technology groups are in different phases in the process of property development. The property development process consists of three phases; T1 technology is in the pre-construction phase, T2 is in the construction phase, and T3 and T4 are in the post-construction phase (Figure 1). The pre-construction phase consists of eight stages, namely study process, analysis, decision making for planning that can be assisted with technology as an input of production (T1). This T1 technology can simplify, and accelerate acquisition, data processing to take development decisions, and improve development productivity. There must be an adjustment of production factor when using T1 technology. T2 technology helps during the construction phase as a tool for building realization and planning and construction management. The structural, development, and financing processes will be carried out in the construction phase to produce property products. Management and operations in the use of this property product can be assisted with T3 technology. T3 technology is a technology that helps operational processes, optimizes building performance and control. Management and operation of property products can be carried out directly by property developers and others. T3 technology can also be used by end-users of property products [18]. Tenants can benefit from its function during the production process. T3 also will be useful for property developers who manage their property products by themselves. If the developers sell their product - buy or rent property, they can use T4 technology. T4 technology plays a role in introducing property products to the public, promoting, and transacting with consumers.

T1, T2, T3, and T4 represent the roles of Property Technology, Construction Technology, and Financial Technology. T1 technology is a part of Property Technology that helps in data collection as an input in the study and planning process. One of the Property Technology categories included in T1 is the property products search that plays a great role in market and competitor studies. T2 technology is part of Construction Technology that helps in the construction process and construction management. T3 technology is a Property Technology that belongs in the post-construction phase. Property Technology at this phase helps in the process of managing property products by end users. The smart real estate category presented by Baum is one category that describes technology in the property management. The use of technologies such as IoT enabling the developers to monitor, optimize building

**Figure 1. Mapping the Technologies on Property Development Process**
performance to communicate with tenants or users in property products. The existence of a sensor system in buildings can reduce the risk of damage, and excessive energy use by early detection before problems occur. This technology product falls into the category of smart real estate or smart building. Property Technology that is applied in the operation of property products can usually provide input to operators regarding performance information, utility conditions, tenants’ needs to building occupancy. The digitization of operations on these property products can increase the use value, the economic value of property products, and optimize the use of energy and space. T4 technology is part of Financial Technology that belongs to the property sector or Fintech Real Estate. This technology helps in the marketing process and transactions between consumers and property developers. T4 enables the developers to connect with consumers indirectly and without a mediator in the process of communication, negotiation, and transactions.

Property Technology, Construction Technology, and Financial Technology have their respective parts and roles in the stage of property development. The mapping of Property Technology, Construction Technology, and Financial Technology in the development phase are carried out based on the classification of technologies T1, T2, T3, and T4 which based on the function of the technology. Property Technology plays a role in the pre-construction phase which consists of stages of initiation, site study, market studies, land acquisition, feasibility studies, design, financing, contract negotiations, and agreements. Property Technology in the pre-construction phase is able to ease the work of property developers in analyzing, storing, displaying, obtaining data, and also communication between divisions [29]. Property Technology plays a role in the post-construction phase helps the management of property products by end users. Construction Technology is in the construction phase in the implementation phase of property products. Financial Technology in the post-construction phase in the exit strategy stage can help investors to make strategic decisions for returning capital or getting benefits from property products that have been realized.

Property Technology, Construction Technology, and Financial Technology in the development process also have different scopes. The easiest way to distinguish these three technologies is to map them in the stage of property development based on their functions. Property Technology, Construction Technology, and Financial Technology use the same distribution media, which is software and hardware, so distinguishing them based on their distribution media is pointless. All technologies that play a role in the pre-construction phase and building management phase are a part of Property Technology. Construction Technology is a technology in the planning implementation stage while Financial Technology is in the exit strategy stage.

3.6 The Role of Technology

Technology in the process of property development is able to optimize the activities and performance of the workforce. Optimization of processes and development performance can be seen as innovation as an outcome. On the other hand, technology is also able to provide innovations that revolutionize the property development process. The impact of this technology becomes a part of innovation as a process [19] that can change the ways, methods, business models, and activities in property development.

Property Technology can be as a solution for dealing with risks, challenges, and improving the quality of performance in the property industry, optimizing the use, sale and rental of property [13,14,18]. Developers are competing to innovate in developing a better property and designing a better quality product. Technology is an opportunity for developers to rise above their competitors. Property Technology is here because of the changes in consumption patterns and the use of digital products [21]. Digitalization in the property sector is considered to facilitate all matters both in the development and the management of property. For example, the design documentation process is affected by the presence of Virtual Reality and Sketchup software that allows developers to evaluate the design directly through three-dimensional visualization. The visualization of the design with Virtual Reality helps developers and designers to perceive space in three dimensions even before it is built. They can look at the quality of space, resolve conflicts before construction, and do environmental studies [30]. Both examples of this
technology are included in Property Technology with the category of real estate documentation. Property Technology can change the process of property development in the process of property management stage. Smart real estate is an example of digitalization in the process of managing a property. Property operators can supervise and manage property digitally with a system that is able to provide information on energy use, tenant needs, occupancy rates, and security of property products. The supervision process can be controlled indirectly without field observation. Property Technology in property management is able to reduce 25 percent of the operational costs of the same type of property product [31].

In the property marketing process, Real Estate Fintech can change the way we do our transaction, communicate, and consume property products and property services. This technology aims to facilitate every process and consumer activity in the property sector [32]. Developers and consumers can process transactions and communication without a face to face meeting and without a mediator. One of the categories of Real Estate Fintech is portfolio management that helps investors to determine property financing options [24]. This technology provides data as a basis for making funding and reference investment decisions. The payment system category is another category of Real Estate Fintech that serves the process of offering property products to the public and mediates the process of communication between property owners and consumers. An example is the Airbnb application that offers rental property products that can be searched and sorted by needs, facilitating communication between tenants and property owners, and leasing transactions.

Construction Technology eases the burden of property development, control, and the management of property development process. Construction Technology can regulate and control the construction process and reduce the risk of delays in the process. One of the uses of Construction Technology in construction management is Microsoft Project software. This software is able to set the timeline, predict the time of completion, to provide an estimate of the minimum delay in the sub-stage of development so it can still be completed on time.

4. Synthesis

Despite the many roles Property Technology, Construction Technology, and Financial Technology have in property development, they do not in fact present in all stages of property development. Many authors explain Property Technology as the use of technology in the property sector. Based on the literature study, we find out that there are three types of technology that can be applied in the development process namely Property Technology, Construction Technology, and Financial Technology. Property Technology is only one of the technologies that have a role in the pre-construction stage and management stage of property assets. Construction Technology plays a role in the implementation phase and Financial Technology plays a role in the exit strategy phase in the post-construction phase. The intersection between Property Technology and Financial Technology is referred to as Real Estate Fintech, namely the expansion of the scope of Financial Technology activities in the property sector.

Only a few authors see Property Technology an innovative way, a method, or a tool that is capable of changing the processes in the property sector, especially the property development process. It means Property Technology is an innovation changes the way, model, and process of property development. Property Technology is more often interpreted as the use of technology as a tool in the property sector. With this explanation, Property Technology is only seen as a tool that only capable to improve efficiency and process effectiveness in the property sector.

The right way to separate Property Technology, Construction Technology, and Financial Technology is to map the scope of its role in the process of property development. Many authors cannot tell the difference between Financial Technology and Property Technology. Some authors even made a mistake to include wrong categories in Property Technology category even though they should be classified as Financial Technology. Most authors are unable to separate Property Technology, Construction Technology, and Financial Technology in the property sector.

There is an opportunity for other researchers to find out more about the implications of Property Technology that changes the pre-construction process. Several studies have begun to find changes in the
property development process in property management [22,23,33,34]. The property management phase is changing with the existence of smart real estate products and the technical revolution in the use of property products which called by shared economy [23].

Smart city development must be balanced with an increase in productivity and performance of working in the property and infrastructure development process. Increased productivity and performance of working can be supported by technology as a tool or even a new method. Developers need to consider three types of technology in the property development process, namely financial technology, property technology, and construction technology. Most writers from Indonesia explained property technology as a company using technology in offering products with different business models. Developers need to know this third technology is not only a tool that can improve efficiency, effectiveness and work performance. This technology consist of methods or ways of working that can change business models and property development processes such as in the smart home property management process.

5. Acknowledgement
This article was presented at the 2nd International Conference on Smart City INNOVATION (ICSCI) 2019, jointly held by Universitas Indonesia and Universitas Diponegoro. ICSCI conferences have been supported by the United States Agency for International Development (USAID) through the Sustainable Higher Education Research Alliance (SHERA) Project for Universitas Indonesia’s Scientific Modelling, Application, Research, and Training for City-centered Innovation and Technology (SMART CITY) Center for Collaborative Research, administered through Grant #AID-497-A-1600004, Sub Grant #IIE-00000078-HK-1. This study is supported from the Master Thesis Research Grant by Kementrian Riset, Teknologi, dan Pendidikan Tinggi Republik Indonesia (KEMENRISTEKDIKTI) 2019. Number: NKB-1897/UN2.R3.1/HKP.05.00/2019.

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