An observation on the quality of interfaces in order to understand the complexity and coherence of informal settlement: A study on Tamansari Kampung in Bandung

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Abstract. Self-organized settlements are formed within the limited capacity of the inhabitants with or without the Government’s interventions. This pattern is mostly found in the informal settlements, where occupants are the planners who are guided by their needs, limited resources and vernacular knowledge about place making. Understanding the process of its development and transformation could be a way of unfolding the complexity it offers to a formal urban setting. To identify the patterns of adaptation process, a study of morphological elements (i.e. house form, streets) could be a possible way. A case study of an informal settlement (Kampung of Tamansari, Bandung in Indonesia) has been taken to dissect these elements. Two of important components of the study area: house forms and streets created the first layer of urban fabric. High population density demanded layers of needs and activities which eventually guided the multifunctional characteristics of streets and house forms. Thus, streets create dialogue with the complex built forms—often known as interface—is the key element to understand the underneath order of Tamansari. Here interface can be divided into two categories depending on their scale—small and large. Small scale interfaces are comprised of small elements such as, extended platform, fence, steps, low height wall, blank wall and elements to set above, set forth, set over in house forms. These components help to create and define semipublic spaces in the settlement. These spaces could be visually and physically interactive or no interactive which result into active or inactive spaces respectively. Small scale interfaces are common features of the settlement, whereas large scale interfaces are placed at strategic locations and act as active spaces. Connecting bridges, open spaces and contours often create special dialogue within and beyond the study area. Interfaces cater diversity in the settlement by creating hierarchy of spaces. Sense of belonging and scope of personalization of the inhabitants are integral parts of alleyways and thus they create a complex yet coherent urban fabric. Apart from the physical elements, the settlement embodies some intangible assets like social bonding, trust, kinship, empathy and sense of belonging that add value to the spatial quality which is a distinctive character of Tamansari kampung. Informal settlements are certainly complex in nature, as it is an outcome of multiple people working to accommodate multidimensional needs. Whereas in a formal system, approach to cater for need is guided by a set of rules developed by a set of professionals end up in creating prototypes irrespective of necessity, affordability and cultural diversity. Cities throughout the world, are experiencing rapid urbanization creating different urban issues. Therefore, it is highly necessary to address different need and affordability of users and come up with suitable urban solutions. Understanding Tamansari Kampung as an informal settlement will enrich the knowledge and expertise to work in complex urban settings.

1. Introduction: Informal settlement

With half of the global population living in urban areas, cities are growing and expanding beyond capacities. Concentration of economic and social activities in urban areas catalyze large scale rural-urban migration and increasing demand of job, housing and infrastructure push cities towards major transformation. In response to this rapid urban development trend, urban areas of emerging economies host informality to some extent. Due to the limitation of resources and incompetence to accommodate...
and provide basic civic facilities to the rising population, cities with limited resources often opt for alternative solutions in form of informal urbanism.

In general, informal urbanism refers to the outcome of autonomous urbanization from planned urban framework. Traditionally formal planning practices are fashioned on a set of centralized rules and principles, whereas socio-economic factors and bottom up approaches shape informality. Many scholars have emphasized on the process and output of informal urbanism and explored potential of informality. With the idea of more democratic and flexible manner of space utilization, informal urbanization pattern has been presented as an alternative way of shaping cities in various literatures.

The urban realities of formal and informal approaches are much more complex and dynamic. Dovey [1] and Bayat [2] overruled the general idea of informality associating with poverty and illegal urban growth. Simeone [3] defined the theory as a way forward to explore human capacities and opportunities past legislative boundaries. According to Perlman [4], informal growth has significantly contributed towards economic advancement of developing countries and informal urbanism has opened up a prolific trend of urbanization over last few decades. Roy [5] noted a niche idea about informal settlement considering it as a complete package of live, work and recreation. In purview of her, informal urbanism is a mechanism established on human needs, struggles and achievements.

In addition to that, Kamalipour [6] identified morphological study as an efficient tool to unpack informal urbanity. Micro-scale analysis of informality informs us about the interrelations among density, grain size, and mixed use of built environment in response to sociocultural context. Nevertheless, Jones [7] explored resilience of informal urbanism against wider urbanization processes. He identified persistence of resilience in informal settlements via housing forms and adaptation process. Social bonding and unspoken planning agreement among the inhabitants are the driving forces in achieving resilience in the process of obtaining maximum benefit of limited resources. Jones [7] advocated understanding informality as coping mechanism of the locals (residents of the case study, Tamansari, Indonesia) by physical and spatial elements.

Urban informality has been observed, analyzed and addressed in various literatures from different aspects, i.e. spatial growth, physical form and their relationships, assemblage and coherence and so on. The tightly knitted informal settlements have been studied to understand the complex yet coherent nature. Salingaros [8] explored coupling between built forms and connectivity at small and large scale to unfold the complexity it offers to a formal urban setting. Following analysis of urbanist Jane Jacobs, Salingaros [8] identified geometric complexity of small scale built forms cater to a coherent urban fabric and “people-people and people-object” interaction is the core component of complexity. Often, these diverse mode of interactions develop a unique dialogue with multifunctional grains of informal settlements-known as interfaces. In same spirit of Salingaros [8], Roy [5] and Kamalipour [6], this paper will analyse interfaces to understand the underneath order of informal urbanity.

2. Case Study of Tamansari Kampung, Bandung
Bandung- capital city of West Java is the third largest city of Indonesia in terms of population size [9][10]. During the Dutch colonial period, the city was developed as a resort city for Dutch tea plantation owners and was often referred as “Parijs van Java or Paris of Java” [9]. However, after independence the city developed rapidly and transformed from a tranquil town to a bustling mega-urban district. Despite of having a planned urban structure, a significant part of Bandung developed out of formal planning system to accommodate influx of migrants in post-World War II period. Under new governance, large localities of the city were divided into sub-districts and each sub-district consisted of large and small village groups known as “ Rukun Warga (RW)” and “Rukun Teangga (RTs)” respectively. Since then, like many other Asian cities, these under serviced urban areas have been the source of refuge and income for relatively low income population in Bandung. The case study has been conducted in one of these settlements (Kampungs) of the city.
Among the kampungs of Bandung, Tamansari is positioned at the fertile valley of Cikapundung River. The precinct was formerly known as ‘Lebak Gede (great valley)’ and had been planned to develop as a green belt in colonial period. However, with the change in master plan to develop ‘Lebak Siliwangi’ as ‘multi-functional precinct’ instead of ‘urban lungs’ triggered urban growth [9]. Close proximity to city center, accessibility, increasing demand of land and housing promoted densification of Kampung Tamansari. Cikapundung River and Jalan Kebun Binatang define physical boundary of the study area. The area is wedged amongst Cihampelas Walk, ITB, few luxurious hotels and modern high-rise apartment buildings.

Both natural and manmade forces are responsible for formation and transformation of Tamansari. The Cikapundung River and irrigation channel were the initial forces behind the settlement establishment. Expansion and transformation of the area is shaped up by topography. Jalan Kebun Binatang as an important infrastructure is another driver of change.
3. An observation on morphological elements of Tamansari Kampung

At a first glance, Kampung Tamansari seems to embody the much-known outer shell of any informal settlement. It appears as a highly complex and dense area hindering the development of Bandung city (Figure 2). Low rise horizontal sprawl of Tamansari is a sharp contrast with the adjacent high rise residential blocks with large foot prints, hotels and shopping centers built under formal planning system. The development pattern of Tamansari is organic, based on the vernacular knowledge of the inhabitants. The creation and modulation of spaces are purely intuitive. But this organic character has an underneath order driven by needs of the people living here, which makes it rational.

![Figure 2. An aerial view of Tamansari kampung](image)

In order to understand the spatial logic of this settlement, an analysis on interfaces had been undertaken. Variety of interfaces could be identified in Tamansari kampung. The whole settlement is comprised of two basic elements- house forms and streets which are weaved through interfaces. Primarily, the house forms used to serve the basic need of the occupants and later, transformed into complex features in order to accommodate growing population. Likewise, the streets were used as thoroughfare for pedestrians and slow-paced vehicles. High population density demanded layers of needs and activities which eventually guided the multifunctional characteristics of streets. The streets serve the inhabitants according to their different activities throughout the day which result into an organic layout. Interfaces play a vital role in this regard. In accordance with that, this settlement has been formed to a complex yet coherent system. Therefore, it is important to have a clear idea of interfaces in order to understand the informality of Tamansari.
Here interface can be divided into two categories depending on their scale – small and large. Small scale interfaces are comprised of small elements such as, extended platform, fence, steps, low height wall, and blank wall. These small elements are used to achieve a variety of house forms and street types, according to the need of users. These elements help to create and define semipublic spaces, which act as transitional spaces between the private zone (house form) and the public zone (alleyways as streets). Here, optimisation of space usage is important as the resource is limited. Interfaces offer the flexibility to adapt the various needs throughout a day. In this way, multi-functionality being a prime character of these spaces, makes it a pattern of an informal settlement of this kind. Layers of uses give these spaces a character of complexity.

Small scale interfaces are evident in-house forms making them diverse and complex. House forms reflect the transformation process of the settlement. Previously, detached houses were scattered throughout area on large blocks (figure 3b). However, condensation started with the influx of migrants. Blocks were subdivided to accommodate rising growth and large scale urban infill took place. Built forms went through further adaptation process for optimum utilisation of space. The process is done incrementally where interfaces play a vital role having elements to set the forms forth, above and back (figure c,d,e). Here, housing growth occurred in various stages in different time phases. As the family size grows, according to the need required spaces are occupied and built. However, it falls under a formal system having a definite size of site. The same process happens in Tamansari, without any technical knowledge but using vernacular sense of space.

Figure 3. Diversity in house forms

A typical alleyway of Tamansari is similar in terms of physical form, but it is complex due to its variation in functionality. The spatial pattern of an alleyway is organic which follows needs of the users defined by small scale interfaces (figure 4 and 5). Different types of small scale interfaces support for mixed uses, in terms of the width of alley ways and dwellings, appropriate for live-work condition.
In Tamansari kampung, small scale interfaces help to create a unique dialogue between the public and private uses (figure 6 and7). Here, the flow of space is gradual to ensure a balance between privacy and socio-cultural relationship prevalent within the community. It is a best outcome of the adaptive nature of the spaces according to diverse needs. The spatial flow depicts the coherence of the entire settlement which is a dominant character of its own. In this system, if any small element of interface is being changed or withdrawn, the flow will be lost, so as the coherence.
Figure 6. A plan of a typical alleyway showing flexibility and organic layout.

Figure 7. Different types of small scale interfaces add uniqueness to the alleyways, as well as the scope of creating diversity, multi-functionality, adaptability, flexibility, fluidity and optimisation of space use. Sections through different parts of alleyways and house forms.
Small scale interface is a typical feature of the settlement, whereas large scale interfaces are placed at strategic locations and act as active spaces. Connecting bridge, open space and contour often create special dialogue within and beyond the study area. Interfaces cater for diversity in the settlement by creating hierarchy of spaces. Mimicking the small-scale interfaces, the same gradual flow of space has been maintained in a larger scale.

In some parts, the public realm (surrounding areas of Tamansari) is connected to the private realm (the Kampung) with a transitional space as a bridge over the irrigation channel. Here, the bridge acts as a circulation space as well as a breathing space for the inhabitants (figure 8). In rare cases, moderate size open spaces act as interface. It acts as a transitional space between the main street and small cluster of residences (figure 9). It works as a multipurpose space such as playground, congregation space during religious and cultural festivals etc. As in some parts of Tamansari, the contour shapes up the settlement pattern, interface type is different here (figure 10). The contour acts as an interface in different levels as a physical and visual connection rather being only a physical one.

**Figure 8.** An example of a large scale interface as a bridge over the irrigation channel
Figure 9. An example of a large scale interface as an open space

Figure 10: An example of a large-scale interface as a contour showing public and private realm in different levels

The above-mentioned characteristics of large scale interfaces offer multi-functionality of the spaces which results into a complex spatial pattern. However, the layers of uses are lesser than small scale interfaces. The large scale interfaces serve for both semipublic and public purposes of the users, whereas the small scale interfaces cater only for semiprivate uses. In this way, large scale interfaces add complexity to the settlement while maintaining the coherence in a same manner as the small-scale interfaces do (figure 11).
Figure 11. An image of complexity and coherence through a mix of small and large scale interfaces in Tamansari kampung

Tamansari offers a good source of income generation where the inhabitants are able to sustain their own system of live-work condition. Interfaces play with a great deal of importance in this process. On the main street of Tamansari, the interfaces vary from set forth, set above and set forth, appropriate to house large commercial activities in one storied or double storied structures. They have steps and extended verandah over it to allow people to sit and have a small talk to let them passively contribute in the commercial activities (Figure 12a). In some cases, an extended platform acts as an interface with a floor set above. It gives a sense of enclosure which is appropriate to induce home business within the private realm of residential zones of the kampung (figure 12c). Food carts are placed fixed against blanks walls whereas (figure 12d), temporary moveable carts are drawn in pick hours along the alleyways (figure 12e). A rich variety in commercial opportunity adds different layers and complexity in Tamansari and offers a palette of choice to the users.

Diversity in spatial quality through interfaces has been achieved by negotiating with neighboring sites. Here, social relationship (for example kinship, trust, social bonding and cooperation) influences the underneath order of the settlement. Unspoken agreement prevalent within the community plays a vital role to give shape of the physical settings. Thus, analysis of Tamansari kampung's interfaces allows us to understand the socio-cultural context of this informal settlement.

The system of Tamansari kampung works on the basis of trust and social bonding within the community. Religious beliefs and cultural practices also add value to that. The occupants get the scope of personalization, which add to the diversity of this place. They get the freedom of using their own spaces according to their choices. The priority and preferences are determined by the users according to their needs. The occupants get the freedom of choice and scope of personalisation, which add value to the diversity of this place. Birdcages, tree planters, an aquarium on the extended platforms and verandas depict the different tastes of the users. They get the freedom of using their own spaces according to their choices (figure 13). This character adds richness to the pedestrian experience while walking down the alleyways.
Many of the inhabitants are capable of moving to other parts of the city equipped with better infrastructure and services. But they choose to stay here for several years only because of the quality of social bonding prevailing here. It makes them feel safe, closely knitted and to rely on each other during their hard times. Where the formal system focuses on the physical elements first, Tamansari has been formulated through the exact opposite process. Here, the process is important than the product. Here, a set of people get engaged in the process of places making rather than someone else dictating the spatial pattern who is not a part of the community. While in formal planning system is resulting into social isolation, disrupting mental and physical wellbeing of the inhabitants, Tamansari is a great example to follow.

**Figure 12.** Interfaces offer variety in space quality to allow scope of small business
4. Conclusion
Informal settlements are formed by the inhabitants within their limited resource and capacity. People who are unable to afford government services, make their habitats based on their need and necessity. Hence, diverse people with their various needs add complexity to the urban informality. It is this diversity and complexity that make an informal settlement unique and an alternative solution of complex urban issues parallel to traditional planning system. On the contrary, the formal system prioritise the rules and disciplines over people’s need and individuality. The physical forms lose their very own identity which can only be achieved if importance is given to the dwellers' needs, aspirations and freedom.

Tamansari kampung as an example of informal urbanity, depicts it's own unique characteristics, as oppose to the traditional planning system. In this case, the rules are fluid and flexible which can be understood through the organic spatial pattern (figure 14). On the contrary, the formal systems have fixed rules with rigid spatial layouts. Here, the role of interface is to determine the legal boundaries of properties, where as in informal settlements interface is the place of negotiation [5]. Interface links house forms with streets. It creates the spatial flow of public-private domain. Where in formal systems, this flow of spaces is repetitive and straight forward, avoiding any kind of diversity. However, in Tamansari kampung, this flow is spontaneous and gradual, allowing scopes to create multiple functionality. This particular character makes this place diverse and a complex layout, difficult to understand at a first glance or from an aerial view.
Figure 14. Product of informal urbanism on the foreground, in contrast with the product of formal planning system in Tamansari creating the backdrop

On the other hand, the juxtaposition of uses, forms and spaces make the settlement homogeneous. Every house form depicts an identity of its dweller and it applies for every house in a typical alleyway. Thus, this variation in appearance and functionality gives a unique character to this settlement. It becomes an identity of its own where a balance is maintained without any intentional effort. In this way Tamansari kampung is working in a very harmonious way and forms an identity than the rest of the city of Bandung.

In this settlement, public-private realm is not clearly defined as it is fluid in its nature. The planning and design principles are very much place specific. It is more about social interaction and community living than only being a place of living and working in a fixed urban environment. While the formal system is resulting into social isolation, here sharing is caring is the basis of living. Overlapping of a lot of spatial components makes this place diverse and complex in its nature.

Tamansari Kampung has showed an example of a valuable source of affordable housing and income generation for different socio-cultural context and interfaces play a vital role in the process. This research takes an effort of differing with the popular belief of coupling informal urbanism with chaos and irrationality. It is rather complex in its character than being chaotic which makes the system to work as a cohesive whole.

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