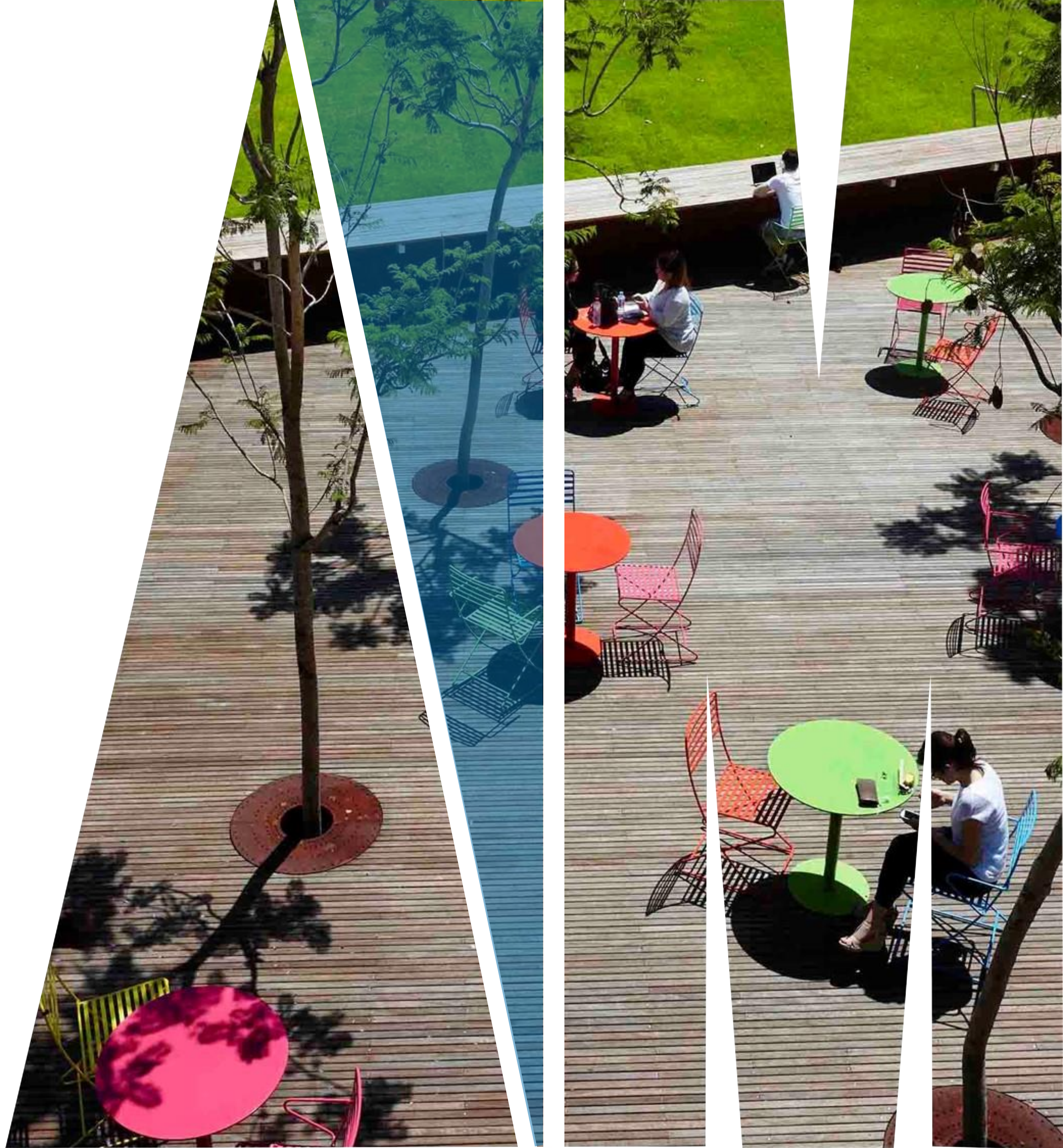
MONASH University

FIT2099 Object-Oriented Design and Implementation

Connascence and Encapsulation



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Outline

Properties of connascence

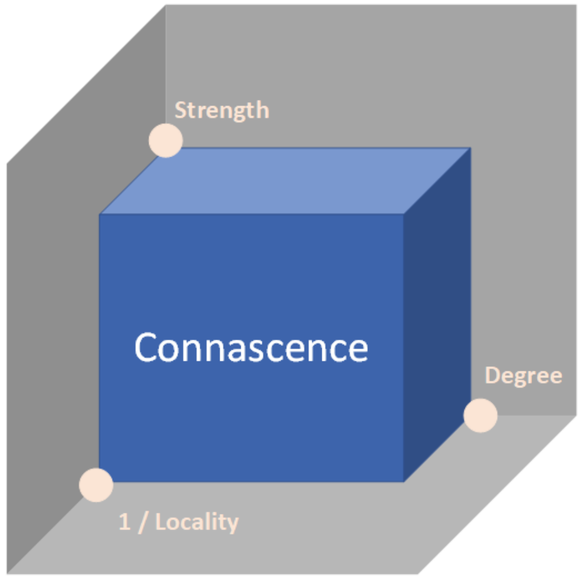
Minimizing bad connascence

Connascence and encapsulation

PROPERTIES OF

CONNASCENCE

1- Strength. The higher level of connascence, the higher the strength.



LEVELS OF CONNASCENCE

Static
- Name
- Type
- Meaning
- Position
- Algorithm

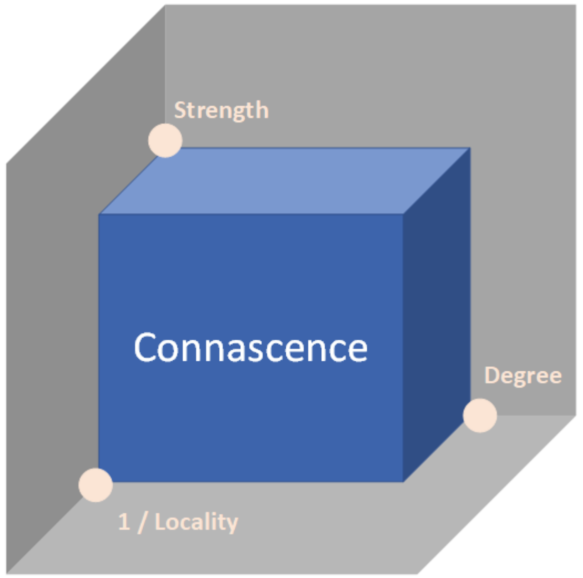
Dynamic
- Execution
- Timing
- Value
- Identity

PROPERTIES OF CONNASCENCE

1- Strength. The higher level of connascence, the higher the strength.

2- Locality. It describes how close the coupled components are.

The higher connascence locality, the better. Coupled methods that are ***in different classes*** *are much* ***worse*** *than coupled methods within* ***same class****.*



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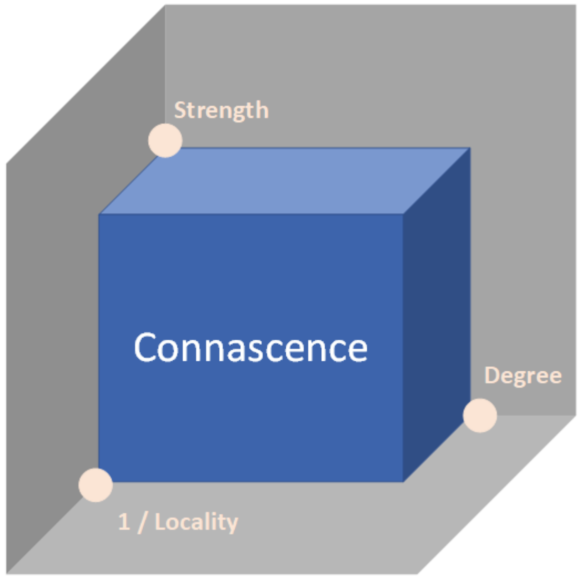

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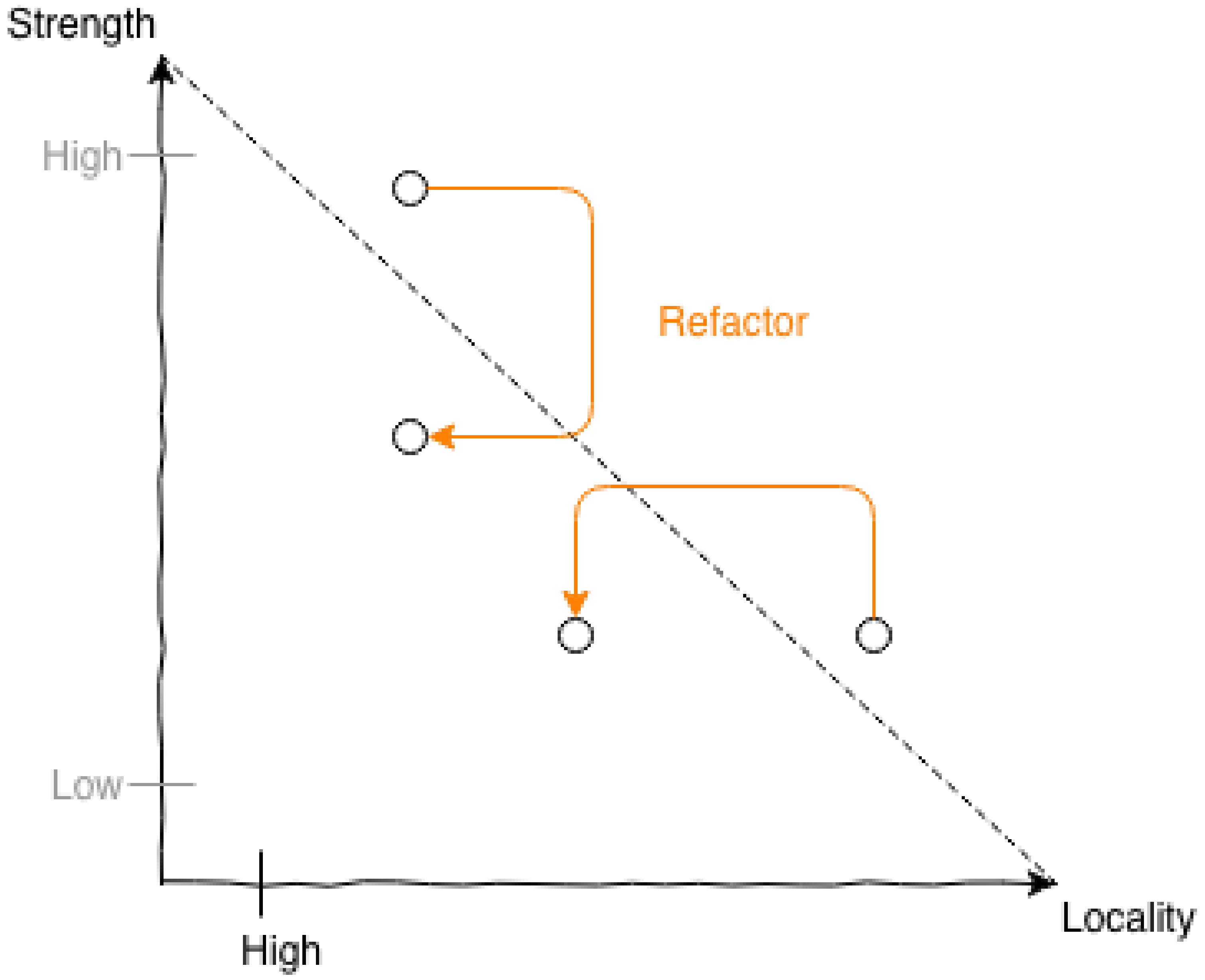
CONNASCENCE AND REFACTORING



PRACTICAL RECOMMENDATIONS ABOUT CONNASCENCE

Not all instances of connascence are equal!

In general, later-listed ones are **worse** than others.

Locality matters!

- **Within a method** -> almost (but not totally) irrelevant.
- **Between two methods in a class** -> often no big deal.
- **Two classes** -> warning warning
- **Two classes in different packages** -> WARNING WARNING!!!
- **Across application boundaries** -> keep to absolute minimum

Explicitness matters

WHAT CAN WE DO ABOUT CONNASCENCE?

1. Minimise overall amount of connascence by breaking system into ***encapsulated*** elements.
2. Minimise remaining connascence that crosses ***encapsulation boundaries*** (guideline 3 will help with this)
3. **Maximise** connascence *within encapsulation boundaries*
   – we’ll talk about “encapsulation” regarding connascence soon!

ENCAPSULATION IN OUR SMART HOME APPLICATION

The final abstract SmartDevice had the following **public** methods:

- One constructor
- Getters and setters
- display()
- turnOn()
- turnoff()

External code have no access to *anything* else.

- So those five methods are the *only* opportunities for **connascence**

Further functionality was added via **abstraction**.

Pretty well encapsulated!

ENCAPSULATION IN THE JAVA COLLECTIONS FRAMEWORK

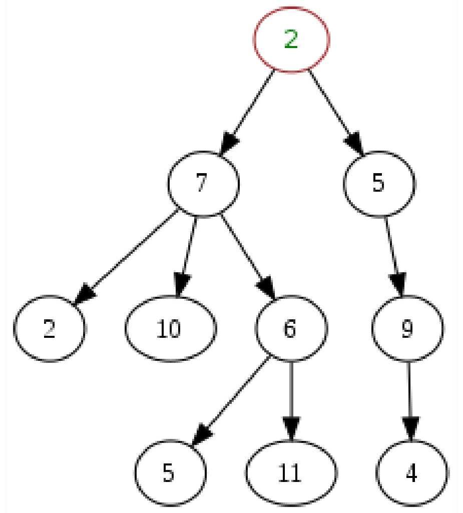
```
class TreeNode<K extends Comparable<K>, V> {

private TreeNode leftChild;
private TreeNode rightChild;

private K key;
private V data;

...

}
```



https://docs.oracle.com/javase/8/docs/api/index.html?javax/swing/tree/TreeNode.html

REDUCING CONNASCENE USING ENCAPSULATION

Using Java is not enough!

- no language is a silver bullet

Design your system carefully

Take advantage of features provided by the **language**

- access control modifiers (`private`, `protected`, etc)
- classes, packages

SIMPLE STRATEGIES TO REDUCE CONNASCENCE

Avoid public attributes

Only make methods public where necessary

  consider a policy of making everything private when you first create it

Keep the class package-private if not needed!

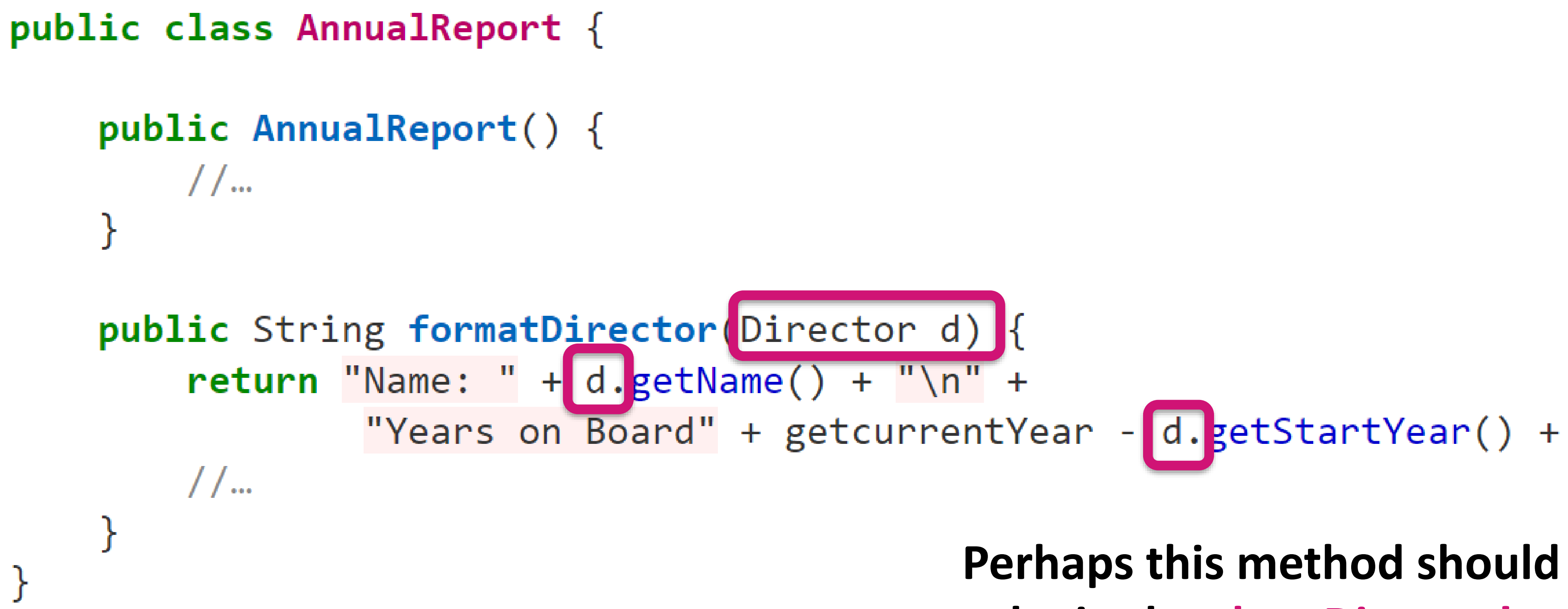
Use `protected` sparingly

  consider using methods rather than attributes

  remember that protected things are accessible to subclasses in ***other packages.***

Simple.

PUT METHODS IN THE RIGHT PLACE



```
public class AnnualReport {

    public AnnualReport() {
        //…
    }

    public String formatDirector(Director d) {
        return "Name:  " + d.getName() + "\n" +
               "Years on Board" + getcurrentYear - d.getStartYear() +
        //…
    }
}
```

Perhaps this method should be in the class Director!

AVOID SIMPLE

CONNASCENCE OF EXECUTION

```java
public class Couple {

    private Person member1 = null;
    private Person member2 = null;
    public Couple() {
    }

    public void setPerson1(Person p1) {
        member1 = p1;
    }

    public void setPerson2(Person p2) {
        member2 = p2 ;
    }

    public String toString() {
        return member1.description() + " " + member2.description();
    }
}
```

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```

MINIMISE

APIs

Application programming interface: that part of a class/package/module that is accessible from outside

aka *public interface*

The smaller and less complicated the interface is, the fewer opportunities for connascence there are

Make things private if you can

Summary

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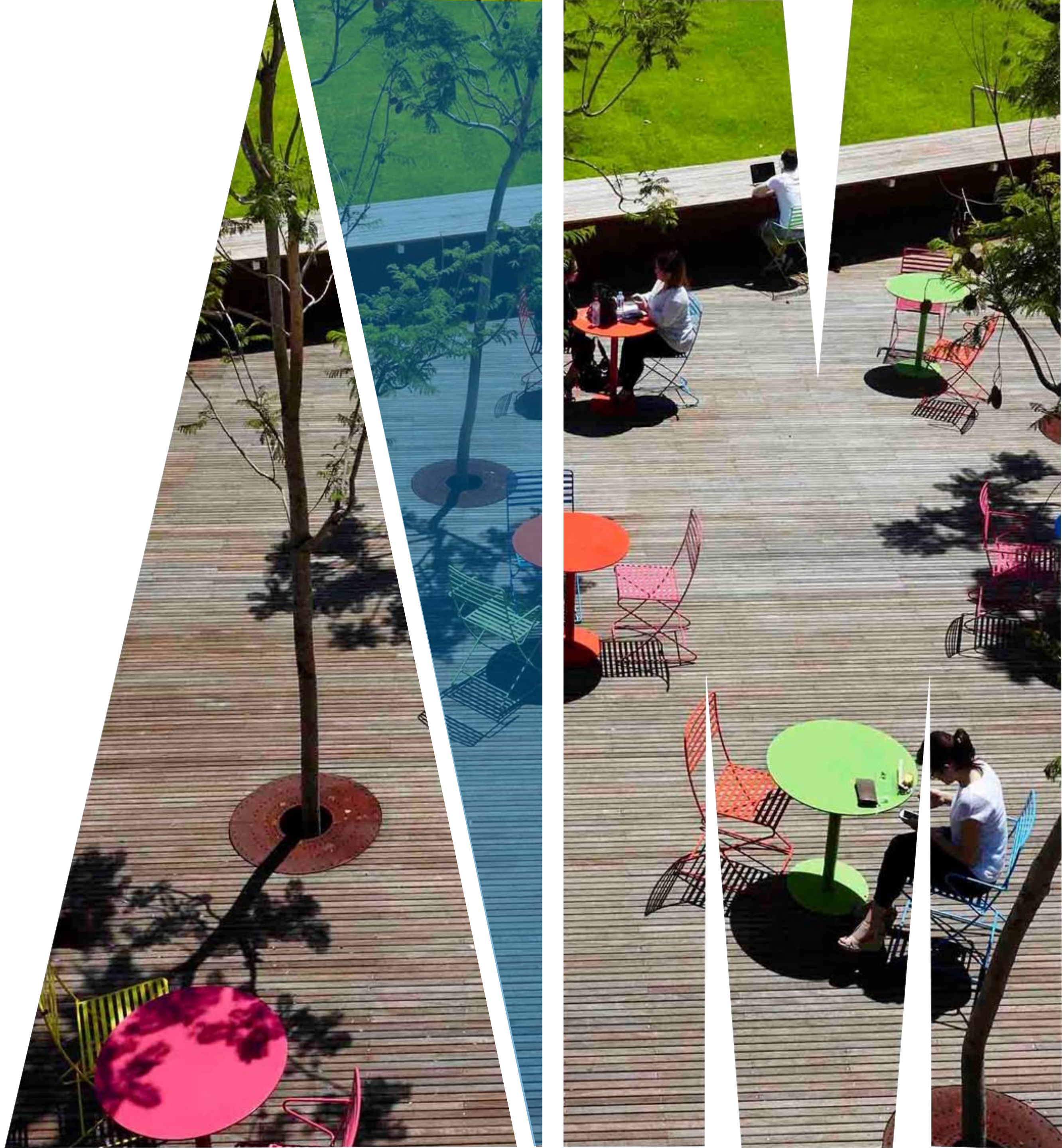
Thanks



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