

# Next Steps for Engineering Systems Interoperability

Robert Fisher, The Boeing Company

GLOBAL PRODUCT DATA  
INTEROPERABILITY  
**SUMMIT**  
**2022**



# Presenters Bio

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- **Boeing Commercial Airplanes**
- **Associate Technical Fellow, Payloads Design Methods**
- **Escape systems, Lighting**
- **Engineering tools & process, Relational design, Automation**

# Next Steps for Engineering Systems Interoperability

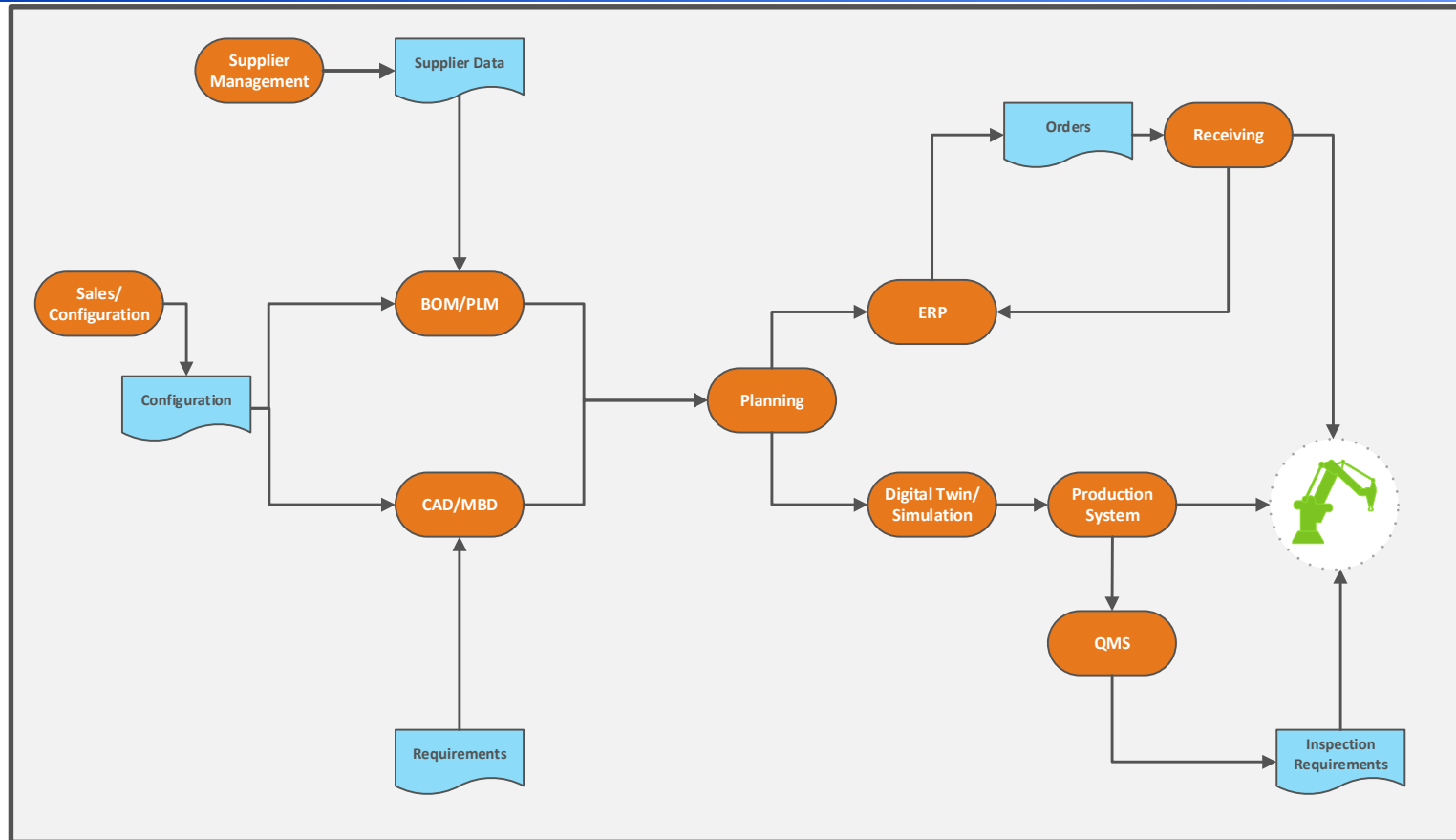
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**Your design team can write code to reduce cost, improve flow and increase their workplace satisfaction.**

**This is the next step in system interoperability.**

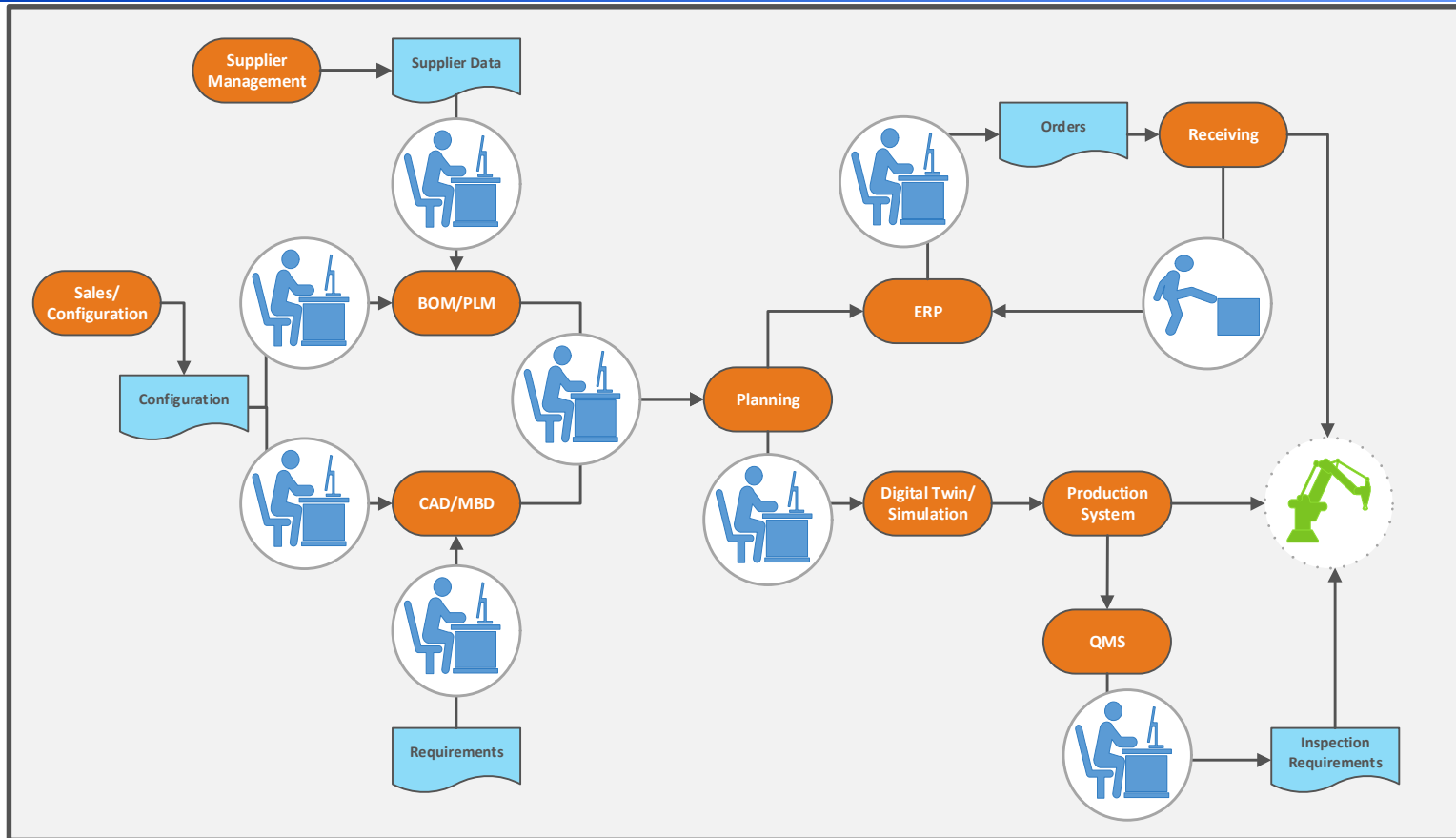
# Engineering business systems

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# People make the systems work

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# Automation is the organization of information

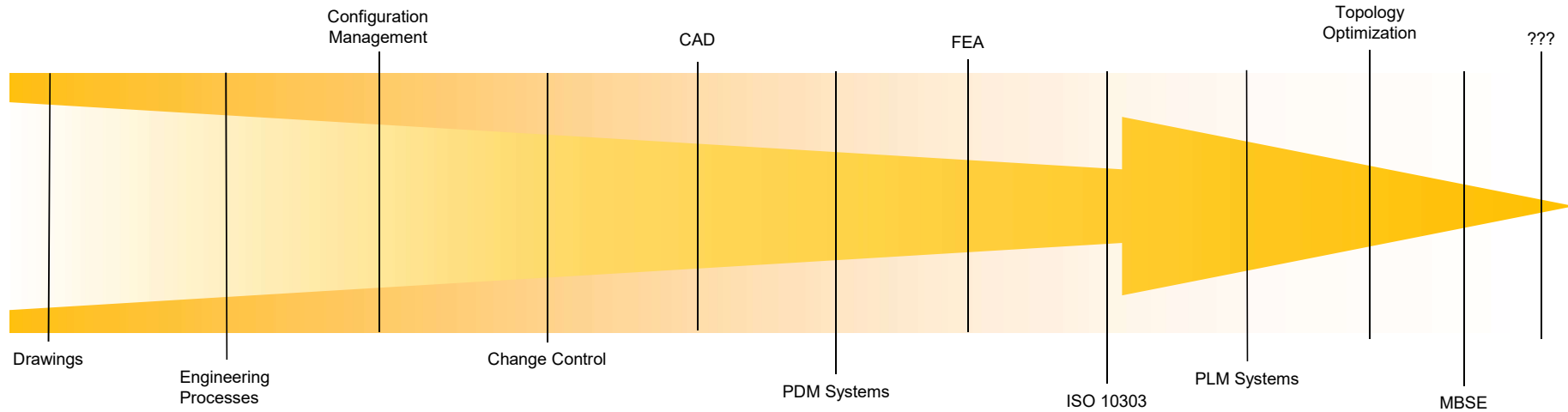
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# Systems, tools, and processes are automation

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Topology  
Optimization



# Automation is not a product

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**Automation is a skill**

**Build that skill in your workforce**



# How to build automation as a skill

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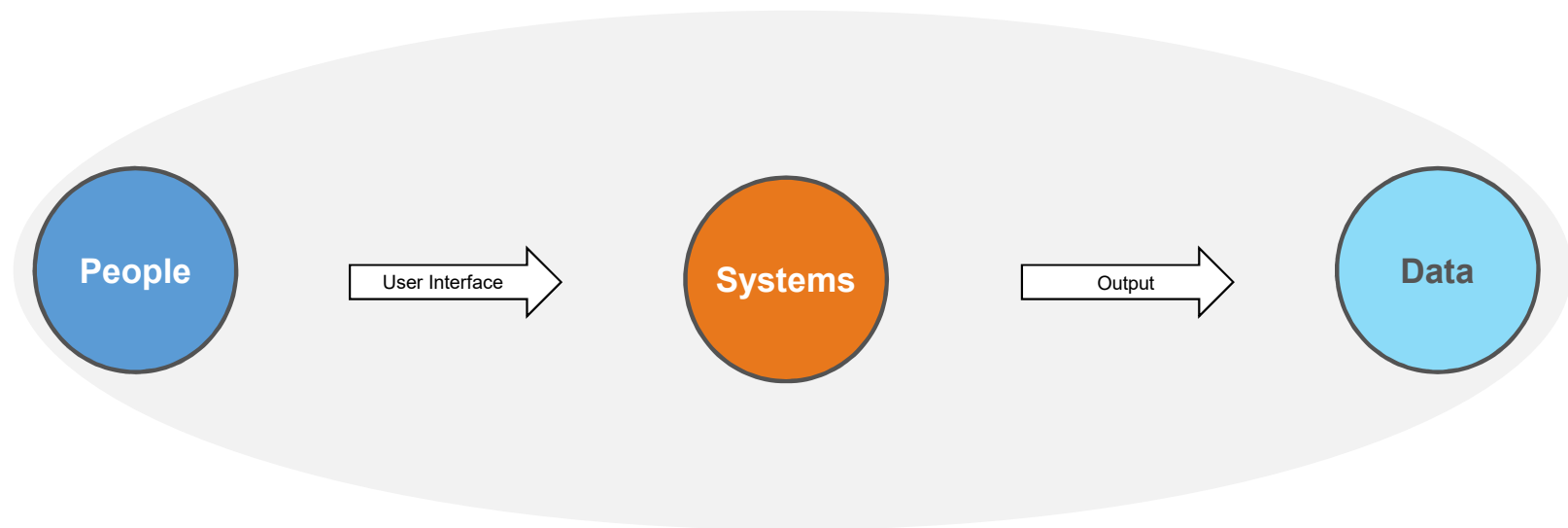
**-Programmatic access to tools-**

**-Access to (good) data-**

**-Employee support-**

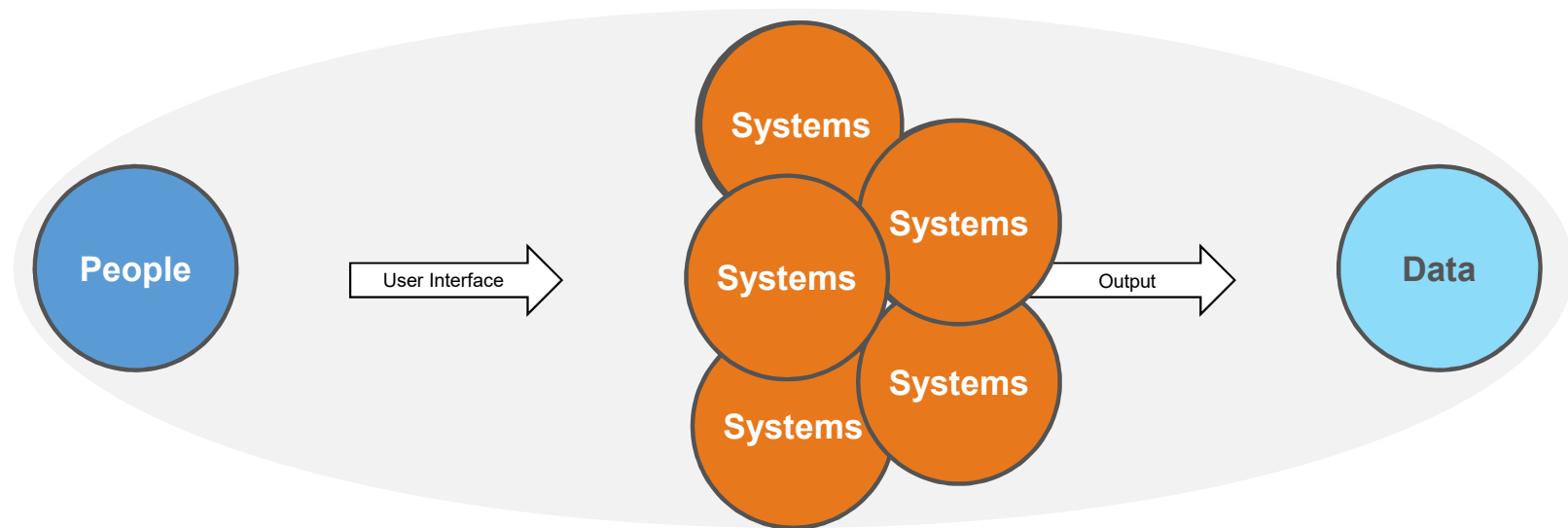
# Traditional engineering relationships

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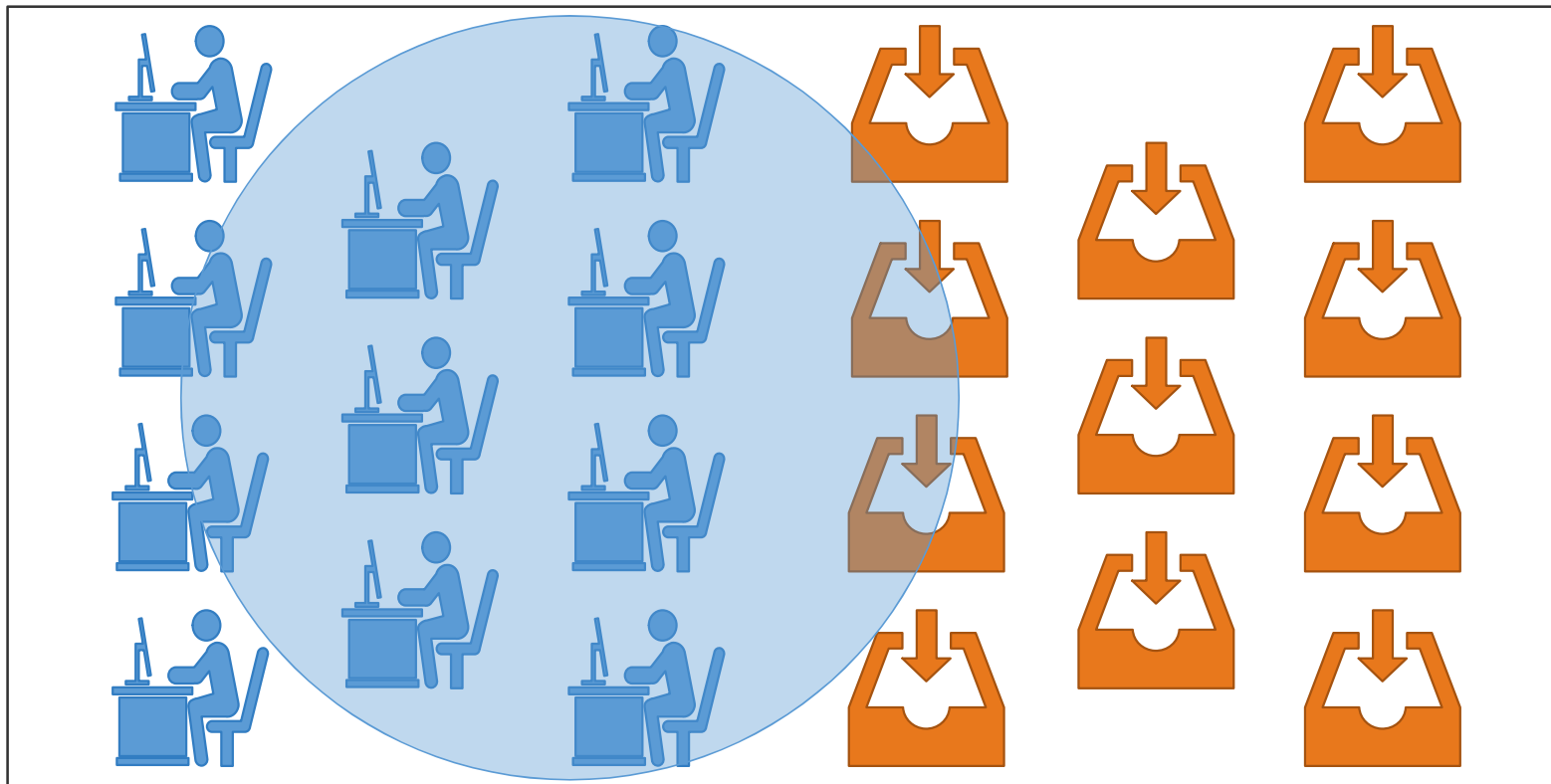
# Traditional engineering relationships with automation

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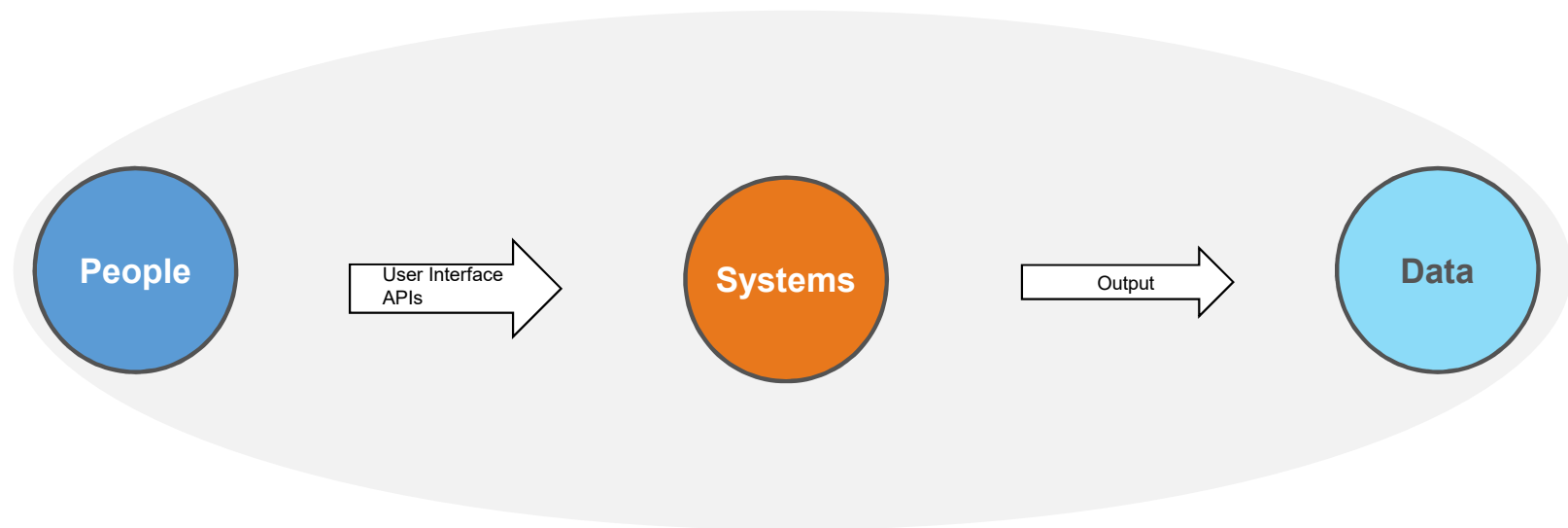
# Effectiveness of purchased automation

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# Culture Shift: Change relationship to systems

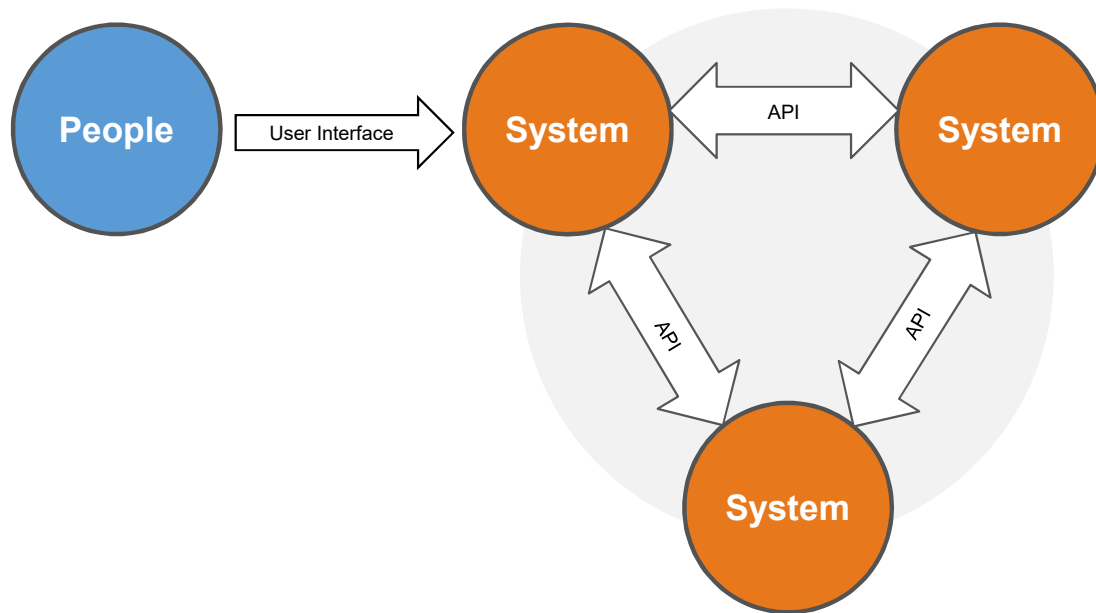
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# Applied Programming Interface (API)

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**APIs provide access to create programs to drive systems**



# Where are the APIs?

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**You already have APIs, but  
(probably) haven't been using them**

# CAD Systems and their APIs

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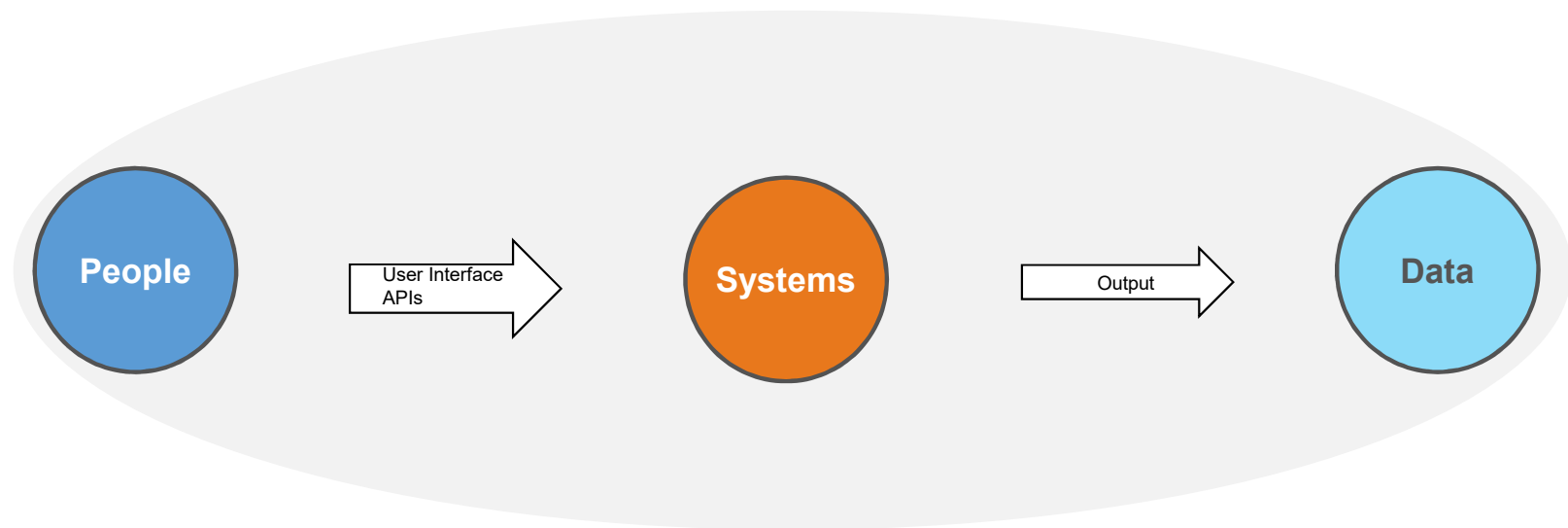
Dassault CATIA	→	COM*
Dassault SolidWorks	→	COM*
Autodesk AutoCAD	→	AutoLISP, COM*
Autodesk Fusion 360	→	JavaScript, C++, Python
PTC CREO	→	.Net, VBA, C, JavaScript
Siemens SolidEdge	→	COM*
Siemens NX	→	COM*
Auto Desk Inventor	→	COM*

\* VBA, .Net, C++, C#, Python



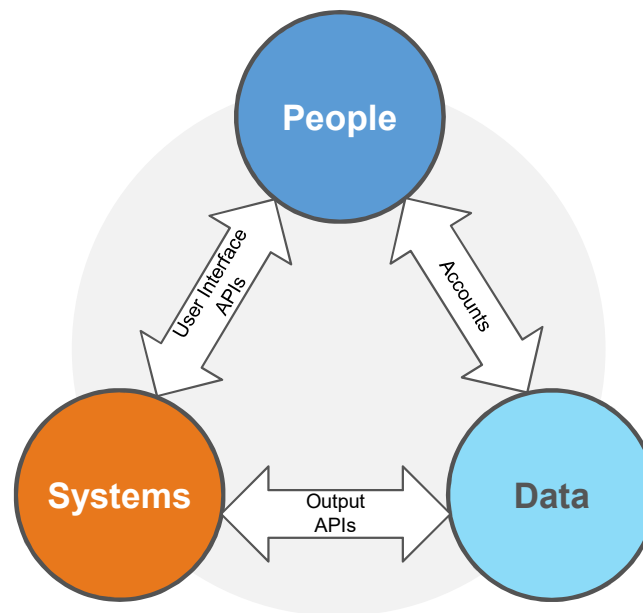
# Culture Shift: Change relationship to data

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# Culture Shift: Change relationship to data

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# What is “good” data?

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- **Neutral**
- **Structured**
- **Authoritative**
- **Digitally stored != Machine sensible**

# Digitally stored vs. Machine sensible

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## Not all data is created equal

### Implied

#	Name	Phone
1	Fisher	123-456-7890
2	Jones	234-999-1989
3	Smith	897-112-5643

### Indexed

	A	B	C
1	#	Name	Phone
2	1	Fisher	123-456-7890
3	2	Jones	234-999-1989
4	3	Smith	897-112-5643

### Explicit

```
{
  "directory": {
    "title": "customers",
    "customers": {
      "1": {
        "#": "1", "Name": "Fisher", "Phone": "123-456-7890"
      },
      "2": {
        "#": "2", "Name": "Jones", "Phone": "234-999-1989"
      },
      "3": {
        "#": "3", "Name": "Smith", "Phone": "897-112-5643"
      }
    }
  }
}
```

# Digitally stored vs. Machine sensible

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## Not all data is created equal

### Implied

#	Name	Phone
1	Fisher	123-456-7890
2	Jones	234-999-1989
3	Smith	897-112-5643

**Useless**

### Indexed

	A	B	C
1	#	Name	Phone
2	1	Fisher	123-456-7890
3	2	Jones	234-999-1989
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**Proprietary**

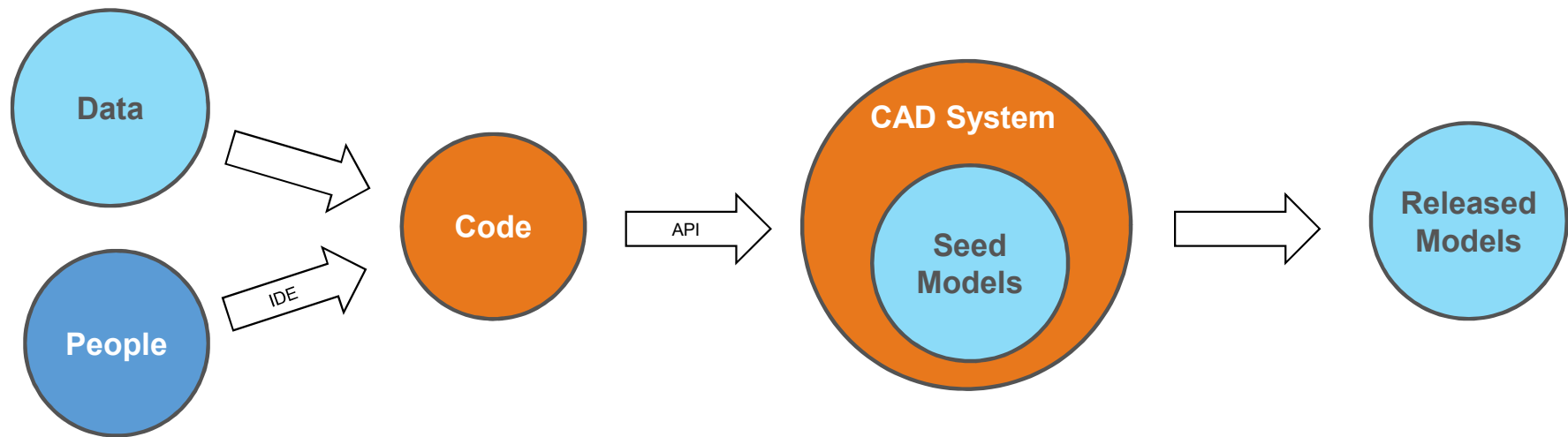
### Explicit

```
{
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    "title": "customers",
    "customers": {
      "1": {
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      },
      "3": {
        "#": "3", "Name": "Smith", "Phone": "897-112-5643"
      }
    }
  }
}
```

**Invaluable**

# Putting it all together

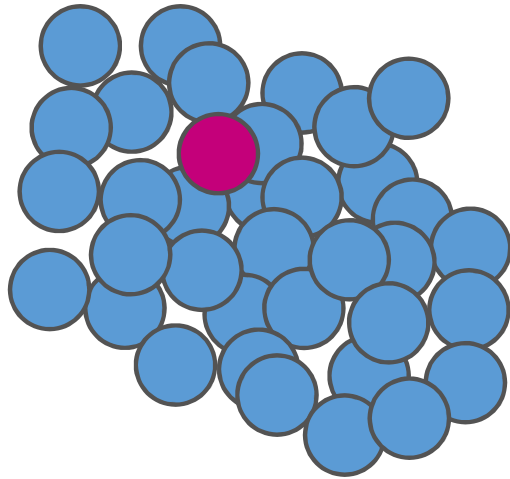
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# People

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## How do we find these people?



**College recruiting**

**Formal communication**

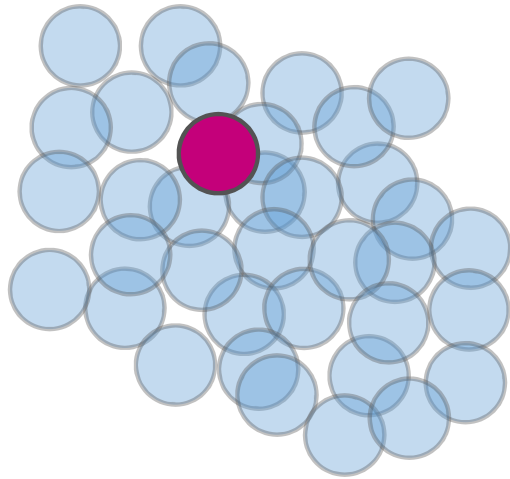
**Conversation**

**Sharing**

# People

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## How do we engage these people?



**Listen for pain points**

**Demo existing projects**

**Socialize results**

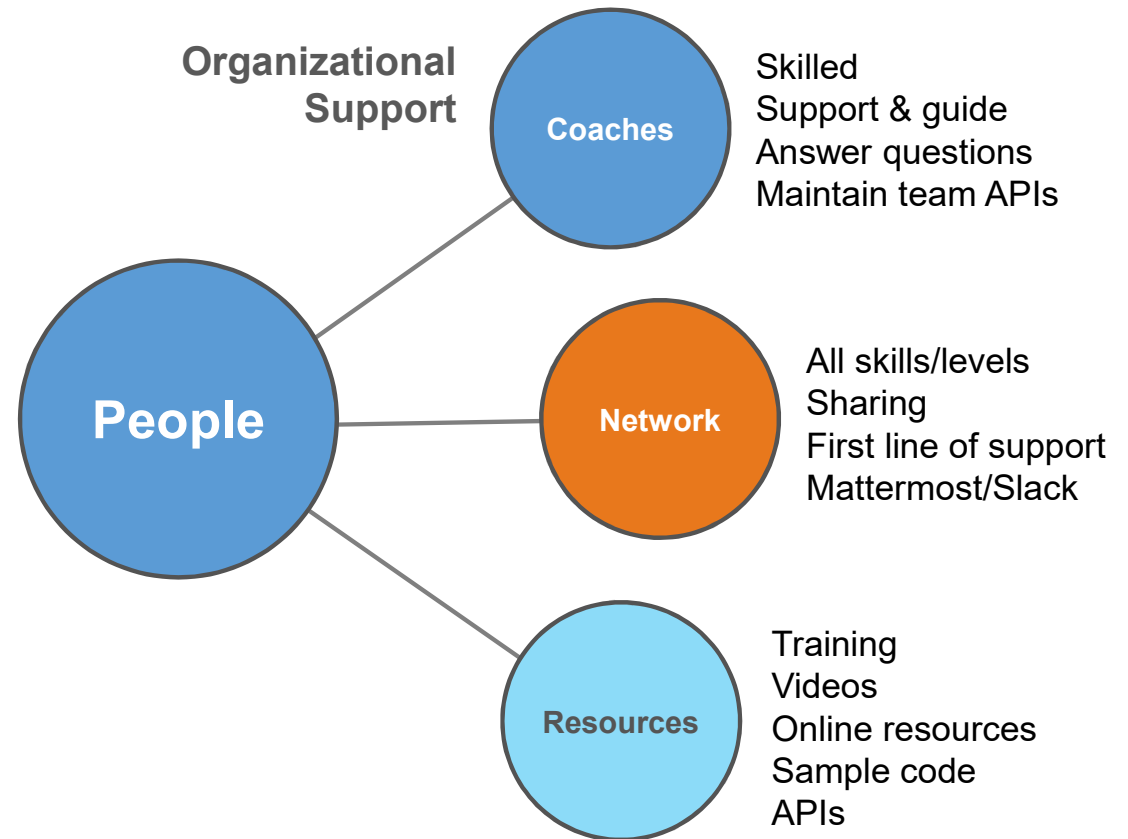
**Promote success**

**Be transparent**



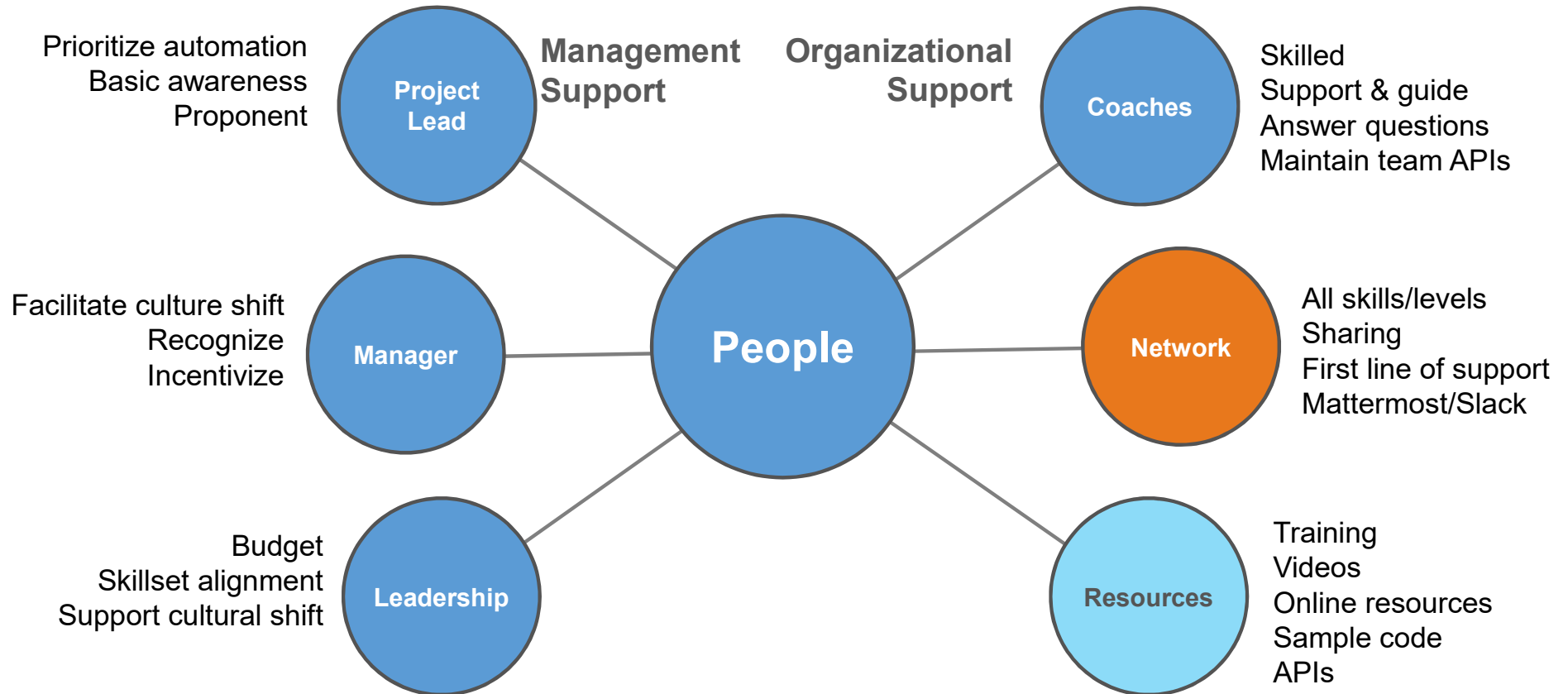
# How do we support?

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# How do we support?

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**-Programmatic access to tools-**

**-Access to data-**

**-Employee support-**

**Design teams creating automation**

# What about IT?

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**...but this is what our IT organization  
already does**

# What about IT?

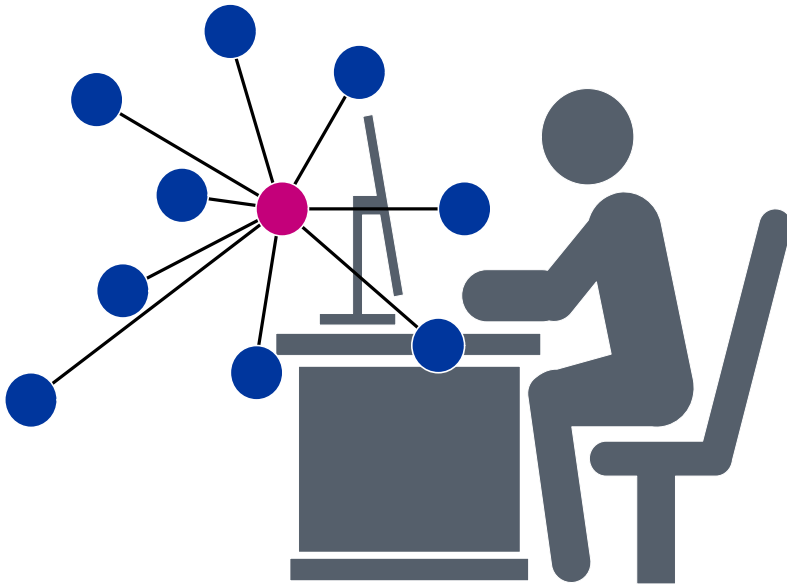
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**...but this is what our IT organization  
already does**

(sort of)

# IT Capabilities

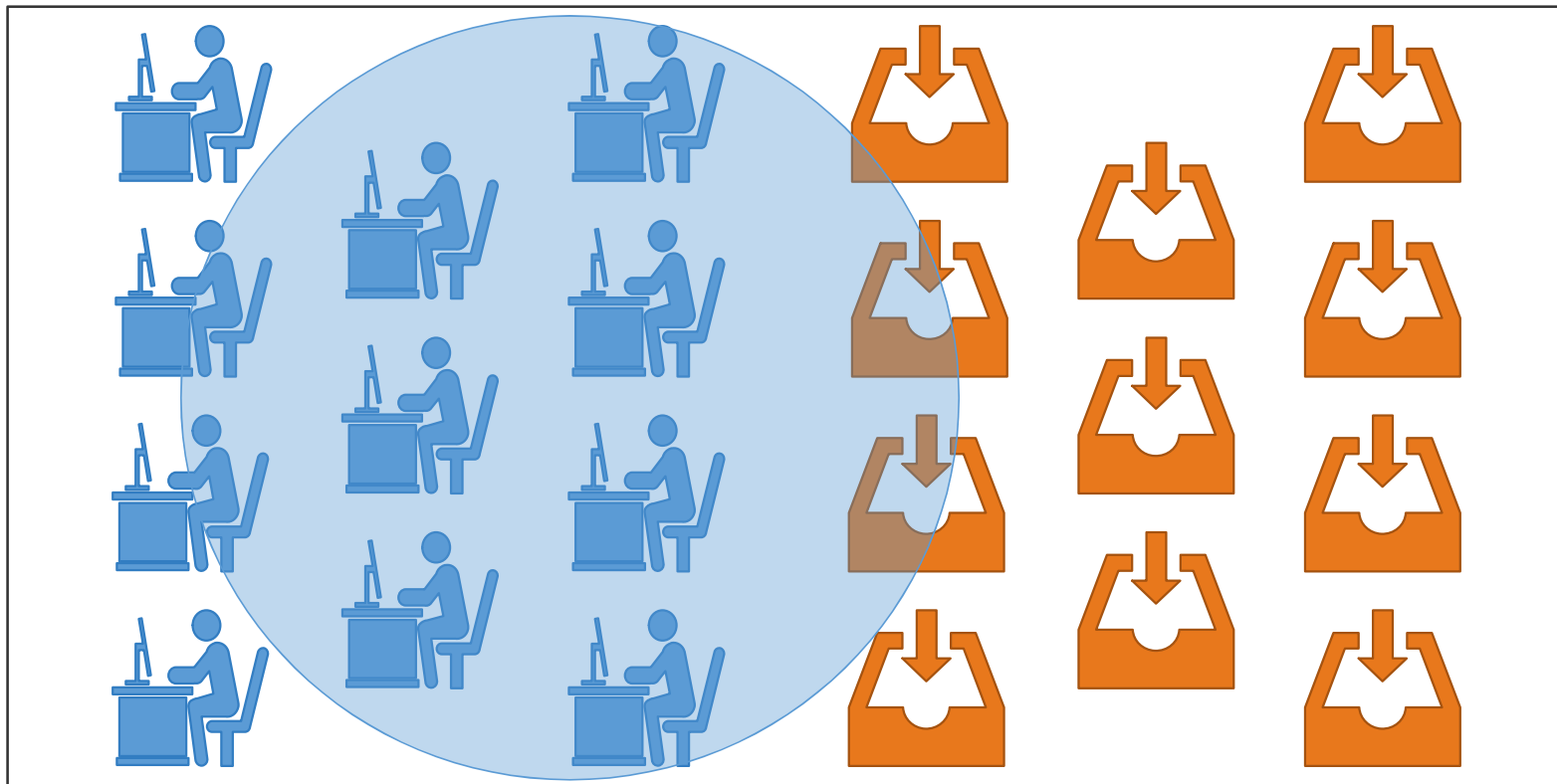
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- **Centralized**
- **Highly skilled**
- **Independently funded**
- **Solves known problems**

# IT automation tools

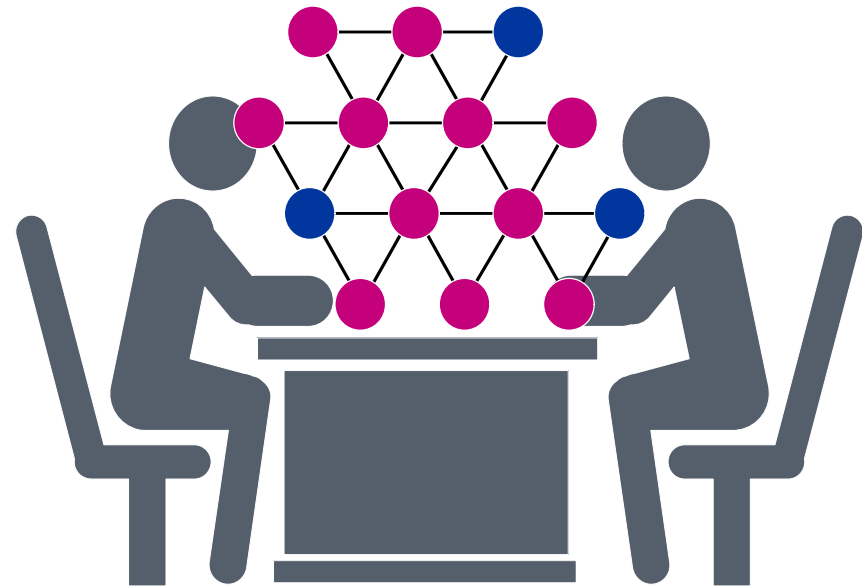
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# Engineering Capabilities

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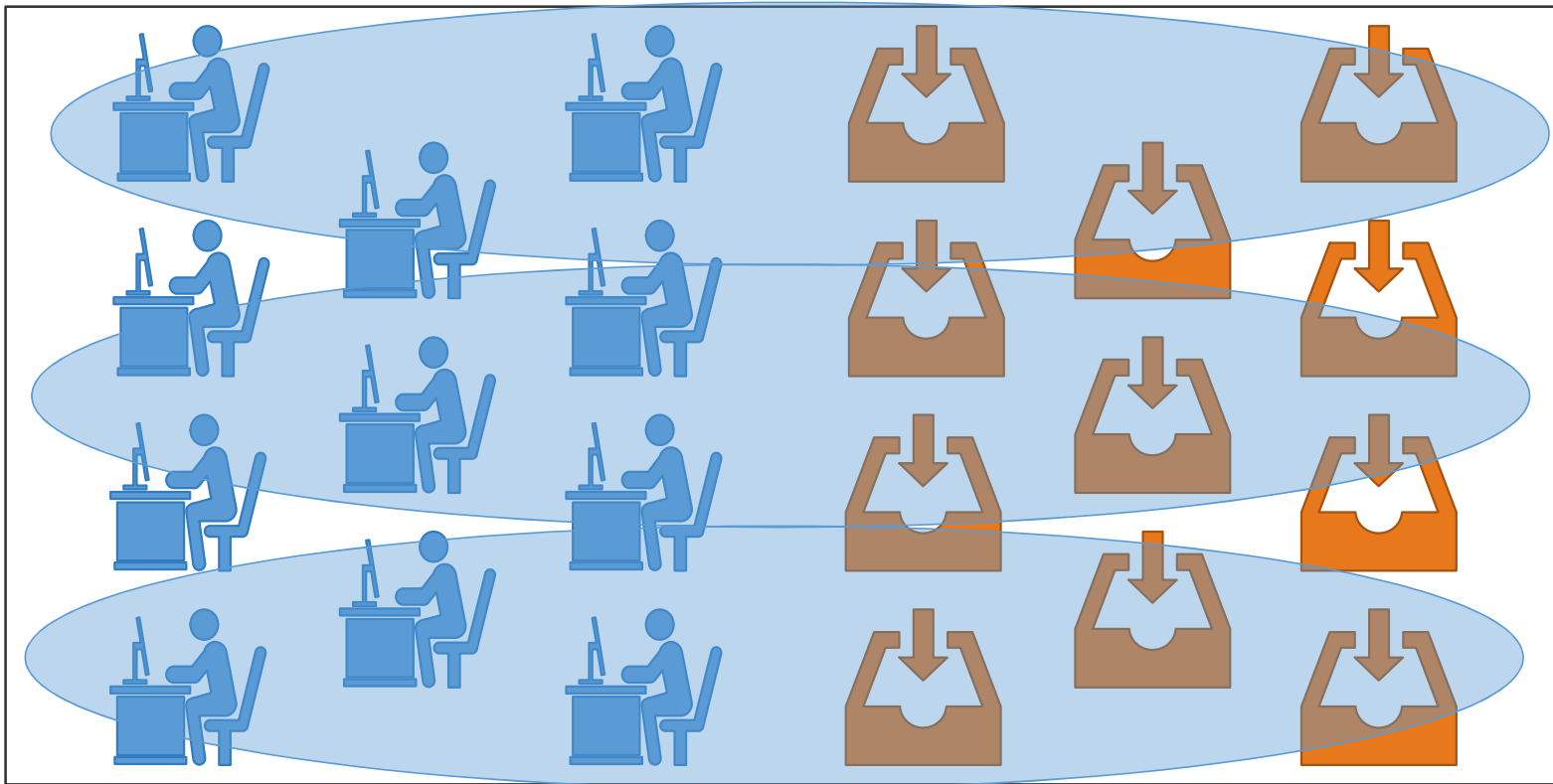
- **Decentralized**
- **Passionate**
- **Directly scalable**
- **Solves unknown problems**
- **More valuable workforce**





# Engineering automation tools

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# Results

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**Does this really work?**

# Four years in...

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## The Good:

- **Cost savings: 80% reduction in engineering hours**
- **Flow: Months → days**
- **Quality: Minor errors eliminated, major errors significantly reduced**
- **Engagement: 3<sup>rd</sup> generation**

## The Hard:

- **Retention: people move up quickly**
- **Culture shift: engineers don't write code, developers do**
- **Guidance: Teams need solid support to avoid pitfalls**
- **Priority: Teams respond to due dates, automation has no due date**

# Next Steps for MBD System Interoperability

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**Questions?**