

## 1.2. Introduction To Software Engineering



Fig. 1.2.1 Photo by ThisisEngineering RAEng on Unsplash

### Note

#### Outline

1. 軟體產業是未來嗎？
2. 軟體能做甚麼？
3. 該如何開發軟體？
4. 程式語言大比拚
5. 軟體一些可能的隱憂...

### 1.2.1. 軟體產業是未來嗎？

1. 創業家兄弟已辦理公開發行，103年營收14.6億, 20150729. [\[PDF\]](#)
2. Agile FunEvo, 讀資工有什麼出路？看台灣軟體產業未來十年的前景敏捷進化趣, 20150728. [\[PDF\]](#)
3. 「資工系」將是未來 20年內將成為最熱門的工作？6 個免費用「玩」的學程式網站分享！20150716. [\[PDF\]](#)
4. 自己寫程式 關鍵競爭力 小學就該會 | 經營管理 | 即時 | 天下雜誌, 20150714. [\[PDF\]](#)
5. Newzoo中美欧iOS畅销榜收入统计：50名之...-游戏葡萄-微头条(wtoutiao), 20150713. [\[PDF\]](#)

6. 如果能夠搭乘時光機，我會給還沒成為軟體工程師的自己這九個建議, Firefox, 20140811. [\[Web\]](#)

7. 人人都該學寫程式的反思：也許我們更該學習的是「電腦思維」, Firefox, 20140520. [\[Web\]](#)

8. 看見美國軟體教育新趨勢, 20131029. [\[PDF\]](#)

9. 米切爾· 瑞斯尼克: 讓我們教孩子編寫電腦程式, 201301. [\[Video\]](#)

1. 麻省理工大學(MIT)媒體實驗室的米切爾· 瑞斯尼克告訴大家: 編寫電腦程式並非電腦奇詭的專利。

1. 這是所有人都能做的事。

2. 在一場有趣、充滿實例示範的演講中， 瑞斯尼克敘述教曉孩子編寫電腦程式的各種好處， 令他們不單單能夠「閱讀」新科技。

1. 亦可以創造新科技。

3. Mitch Resnick directs the Lifelong Kindergarten group at MIT Media Lab, dedicated to helping kids of all ages tinker and experiment with design.

## 1.2.2. 軟體能做甚麼？

1. 2014 年黑帽大會：最安全 Android 手機五分鐘遭破解, Tech News, 20140812. [\[Web\]](#)

2. Bill Gates: 20年後機器人和軟體將造成結構性失業, 天下, 20140512. [\[Web\]](#)

3. Scratch: 创建故事， 游戏和动画与世界上的其他人分享URL, 20140203. [\[Web\]](#)

## 1.2.3. 該如何開發軟體？

1. 寫網站寫到被 YouTube CEO 挖角， 90後工程師公開 coding 學習歷程, 20150728. [\[PDF\]](#)

2. 你的第一個程式語言怎麼選？ 這邊告訴你, 癮科技, 20150725. [\[PDF\]](#)

3. 想當 NASA 工程師， 「Coding 十戒」你必知！ TechOrange, 20150722. [\[PDF\]](#)

## 1.2.4. 程式語言大比拚

### 1.2.4.1. IEEE Spectrum

1. [2021](#)

Rank	Language	Type	Score
1	Python	🌐 🖥️ ⚙️	100.0
2	Java	🌐 📱 🖥️	95.4
3	C	📱 🖥️ ⚙️	94.7
4	C++	📱 🖥️ ⚙️	92.4
5	JavaScript	🌐	88.1
6	C#	🌐 📱 🖥️ ⚙️	82.4
7	R	🖥️	81.7
8	Go	🌐 🖥️	77.7
9	HTML	🌐	75.4
10	Swift	📱 🖥️	70.4

IEEE SPECTRUM

2. [2020](#)

Rank	Language	Type	Score
1	Python ▼	🌐 🖥️ ⚙️	100.0
2	Java ▼	🌐 📱 🖥️	95.3
3	C ▼	📱 🖥️ ⚙️	94.6
4	C++ ▼	📱 🖥️ ⚙️	87.0
5	JavaScript ▼	🌐	79.5
6	R ▼	🖥️	78.6
7	Arduino ▼	⚙️	73.2
8	Go ▼	🌐 🖥️	73.1
9	Swift ▼	📱 🖥️	70.5
10	Matlab ▼	🖥️	68.4

### 3. [2019](#)

Rank	Language	Type	Score
1	Python	🌐 🖥️ ⚙️	100.0
2	Java	🌐 📱 🖥️	96.3
3	C	📱 🖥️ ⚙️	94.4
4	C++	📱 🖥️ ⚙️	87.5
5	R	🖥️	81.5
6	JavaScript	🌐	79.4
7	C#	🌐 📱 🖥️ ⚙️	74.5
8	Matlab	🖥️	70.6
9	Swift	📱 🖥️	69.1
10	Go	🌐 🖥️	68.0

### 4. [2018](#)

Choose a Ranking (choose a weighting or make your own)

IEEE Spectrum Trending Jobs Open Custom

Edit Ranking | Add a Comparison | [Twitter](#) [Facebook](#)

Language Types (click to hide)

[Web](#) [Mobile](#) [Enterprise](#) [Embedded](#)

Language Rank	Types	Spectrum Ranking
1. Python	<a href="#">Web</a> <a href="#">Mobile</a> <a href="#">Enterprise</a> <a href="#">Embedded</a>	100.0
2. C++	<a href="#">Mobile</a> <a href="#">Enterprise</a> <a href="#">Embedded</a>	99.7
3. Java	<a href="#">Web</a> <a href="#">Mobile</a> <a href="#">Enterprise</a>	97.5
4. C	<a href="#">Mobile</a> <a href="#">Enterprise</a> <a href="#">Embedded</a>	96.7
5. C#	<a href="#">Web</a> <a href="#">Mobile</a> <a href="#">Enterprise</a>	89.4
6. PHP	<a href="#">Web</a>	84.9
7. R	<a href="#">Enterprise</a>	82.9
8. JavaScript	<a href="#">Web</a> <a href="#">Mobile</a>	82.6
9. Go	<a href="#">Web</a> <a href="#">Enterprise</a>	76.4
10. Assembly	<a href="#">Embedded</a>	74.1
11. Matlab	<a href="#">Enterprise</a>	72.8
12. Scala	<a href="#">Web</a> <a href="#">Mobile</a>	72.1
13. Ruby	<a href="#">Web</a> <a href="#">Enterprise</a>	71.4
14. HTML	<a href="#">Web</a>	71.2
15. Arduino	<a href="#">Embedded</a>	69.0

## 5. [2017](#)

Choose a Ranking (choose a weighting or make your own)

IEEE Spectrum Trending Jobs Open Custom

Edit Ranking | Add a Comparison | [Twitter](#) [Facebook](#)

Language Types (click to hide)




























[Web](#) [Mobile](#) [Enterprise](#) [Embedded](#)

Language Rank	Types	Spectrum Ranking
1. Python	<a href="#">Web</a> <a href="#">Enterprise</a>	100.0
2. C	<a href="#">Mobile</a> <a href="#">Enterprise</a> <a href="#">Embedded</a>	100.0
3. Java	<a href="#">Web</a> <a href="#">Mobile</a> <a href="#">Enterprise</a>	99.4
4. C++	<a href="#">Mobile</a> <a href="#">Enterprise</a> <a href="#">Embedded</a>	96.9
5. C#	<a href="#">Web</a> <a href="#">Mobile</a> <a href="#">Enterprise</a>	88.6
6. R	<a href="#">Enterprise</a>	88.1
7. JavaScript	<a href="#">Web</a> <a href="#">Mobile</a>	85.3
8. PHP	<a href="#">Web</a>	81.1
9. Go	<a href="#">Web</a> <a href="#">Enterprise</a>	75.7
10. Swift	<a href="#">Mobile</a> <a href="#">Enterprise</a>	74.3
11. Arduino	<a href="#">Embedded</a>	72.4
12. Ruby	<a href="#">Web</a> <a href="#">Enterprise</a>	72.0
13. Assembly	<a href="#">Embedded</a>	71.7
14. Matlab	<a href="#">Enterprise</a>	68.6
15. Scala	<a href="#">Web</a> <a href="#">Mobile</a>	68.0

## 6. [2016](#)












1. [Paper-20170629: N. Diakopoulos and S. Cass, "Interactive: The Top Programming Languages 2016," IEEE Spectrum URL](#)
2. [News-20160729: IEEE Spectrum 公布程式語言最新排行：大數據是贏家 \[TechNews\]](#)

Language Types (click to hide)










Language Rank	Types	Spectrum Ranking
1. C	  	100.0
2. Java	  	98.1
3. Python	 	97.9
4. C++	  	95.8
5. R		87.7
6. C#	  	86.4
7. PHP		82.4
8. JavaScript	 	81.9
9. Ruby	 	74.0
10. Go	 	71.5
11. Arduino		69.5
12. Matlab		68.7
13. Assembly		68.0
14. Swift	 	67.6

# 1.2.4.2. TIOBE

- [\[Web\]](#)
- 20220701

<div> <div>  <div> <div>TIOBE</div> <div>(the software quality company)</div> </div> </div> <div> <div> <a href="#">About us</a> <a href="#">Join TIOBE</a> <a href="#">News</a> <a href="#">Coding Standards</a> <a href="#">TIOBE Index</a> <a href="#">Contact</a> </div> <div> <div>Products ▾</div> <div>Quality Models ▾</div> <div>Markets ▾</div> <div>Request a demo</div> </div> </div> </div>						
Jun 2022	Jun 2021	Change	Programming Language		Ratings	Change
1	2	⬆		Python	12.20%	+0.35%
2	1	⬇		C	11.91%	-0.64%
3	3			Java	10.47%	-1.07%
4	4			C++	9.63%	+2.26%
5	5			C#	6.12%	+1.79%
6	6			Visual Basic	5.42%	+1.40%
7	7			JavaScript	2.09%	-0.24%
8	10	⬆		SQL	1.94%	+0.06%
9	9			Assembly language	1.85%	-0.21%
10	16	⬆		Swift	1.55%	+0.44%

- 20210913

Sep 2021	Sep 2020	Change	Programming Language	Ratings	Change
1	1		 C	11.83%	-4.12%
2	3	▲	 Python	11.67%	+1.20%
3	2	▼	 Java	11.12%	-2.37%
4	4		 C++	7.13%	+0.01%
5	5		 C#	5.78%	+1.20%
6	6		 Visual Basic	4.62%	+0.50%
7	7		 JavaScript	2.55%	+0.01%
8	14	▲▲	 Assembly language	2.42%	+1.12%
9	8	▼	 PHP	1.85%	-0.64%
10	10		 SQL	1.80%	+0.04%

4. 20190829

Aug 2019	Aug 2018	Change	Programming Language	Ratings	Change
1	1		Java	16.028%	-0.85%
2	2		C	15.154%	+0.19%
3	4	▲	Python	10.020%	+3.03%
4	3	▼	C++	6.057%	-1.41%
5	6	▲	C#	3.842%	+0.30%
6	5	▼	Visual Basic .NET	3.695%	-1.07%
7	8	▲	JavaScript	2.258%	-0.15%
8	7	▼	PHP	2.075%	-0.85%
9	14	▲▲	Objective-C	1.690%	+0.33%
10	9	▼	SQL	1.625%	-0.69%
11	15	▲▲	Ruby	1.316%	+0.13%
12	13	▲	MATLAB	1.274%	-0.09%
13	44	▲▲	Groovy	1.225%	+1.04%
14	12	▼	Delphi/Object Pascal	1.194%	-0.18%
15	10	▼▼	Assembly language	1.114%	-0.30%
16	19	▲	Visual Basic	1.025%	+0.10%
17	17		Go	0.973%	-0.02%
18	11	▼▼	Swift	0.890%	-0.49%
19	16	▼	Perl	0.860%	-0.31%
20	18	▼	R	0.822%	-0.14%

5. 20170629



Jun 2017	Jun 2016	Change	Programming Language	Ratings	Change
1	1		Java	14.493%	-6.30%
2	2		C	6.848%	-5.53%
3	3		C++	5.723%	-0.48%
4	4		Python	4.333%	+0.43%
5	5		C#	3.530%	-0.26%
6	9	▲	Visual Basic .NET	3.111%	+0.76%
7	7		JavaScript	3.025%	+0.44%
8	6	▼	PHP	2.774%	-0.45%
9	8	▼	Perl	2.309%	-0.09%
10	12	▲	Assembly language	2.252%	+0.13%
11	10	▼	Ruby	2.222%	-0.11%
12	14	▲	Swift	2.209%	+0.38%
13	13		Delphi/Object Pascal	2.158%	+0.22%
14	16	▲	R	2.150%	+0.61%
15	48	▲▲	Go	2.044%	+1.83%
16	11	▼▼	Visual Basic	2.011%	-0.24%
17	17		MATLAB	1.996%	+0.55%
18	15	▼	Objective-C	1.957%	+0.25%
19	22	▲	Scratch	1.710%	+0.76%
20	18	▼	PL/SQL	1.566%	+0.22%

6. 20150718

Jul 2015	Jul 2014	Change	Programming Language	Ratings	Change
1	2	⬆	Java	17.728%	+2.04%
2	1	⬇	C	16.147%	-1.00%
3	4	⬆	C++	8.641%	+3.12%
4	6	⬆	C#	5.652%	+1.60%
5	8	⬆	Python	4.257%	+1.60%
6	3	⬇	Objective-C	3.344%	-6.95%
7	7		PHP	2.893%	-0.02%
8	12	⬆	Visual Basic .NET	2.423%	+0.93%
9	9		JavaScript	2.194%	+0.39%
10	-	⬆	Visual Basic	1.946%	+1.95%
11	11		Perl	1.812%	+0.18%
12	20	⬆	Assembly language	1.535%	+0.76%
13	17	⬆	Delphi/Object Pascal	1.480%	+0.45%
14	33	⬆	ABAP	1.389%	+1.02%
15	14	⬇	Ruby	1.378%	+0.31%
16	16		Swift	1.234%	+0.18%
17	28	⬆	R	1.229%	+0.82%
18	49	⬆	PL/SQL	1.221%	+0.99%
19	19		MATLAB	1.210%	+0.43%
20	23	⬆	Pascal	1.177%	+0.55%

7. 20140801

Aug 2014	Aug 2013	Change	Programming Language	Ratings	Change
1	2	⬆	C	16.401%	+0.43%
2	1	⬇	Java	14.984%	-0.99%
3	4	⬆	Objective-C	9.552%	+1.47%
4	3	⬇	C++	4.695%	-4.68%
5	7	⬆	Basic	3.635%	-0.24%
6	6		C#	3.409%	-2.71%
7	8	⬆	Python	3.121%	-0.48%
8	5	⬇	PHP	2.864%	-3.83%
9	11	⬆	Perl	2.218%	+0.18%
10	9	⬇	JavaScript	2.172%	+0.08%
11	-	⬆	Visual Basic	2.014%	+2.01%
12	13	⬆	Visual Basic .NET	1.310%	-0.01%
13	10	⬇	Ruby	1.242%	-0.83%
14	23	⬆	F#	1.096%	+0.56%
15	18	⬆	Pascal	1.044%	+0.42%
16	12	⬇	Transact-SQL	1.043%	-0.35%
17	38	⬆	ActionScript	1.001%	+0.69%
18	14	⬇	Delphi/Object Pascal	0.915%	-0.00%
19	16	⬇	Lisp	0.828%	+0.08%
20	17	⬇	PL/SQL	0.786%	+0.03%



# 1.2.4.3. Long Term History

## 1. TIOBE [\[Web\]](#)



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Programming Language	2022	2017	2012	2007	2002	1997	1992	1987
Python	1	5	8	7	12	28	-	-
C	2	2	2	2	2	1	1	1
Java	3	1	1	1	1	13	-	-
C++	4	3	3	3	3	2	2	5
C#	5	4	4	8	18	-	-	-
Visual Basic	6	15	-	-	-	-	-	-
JavaScript	7	7	10	9	9	20	-	-
Assembly language	8	10	-	-	-	-	-	-
SQL	9	-	-	-	7	-	-	-
PHP	10	8	6	5	6	-	-	-
Prolog	23	33	37	27	16	19	15	3
Lisp	33	31	13	15	13	10	6	2
Pascal	270	105	16	20	99	9	3	6
(Visual) Basic	-	-	7	4	4	3	5	4

# 1.2.5. 軟體一些可能的隱憂...

1. Evernote會成為下一隻倒下的獨角獸嗎? 20150722. [\[Web\]](#)
2. Google員工最大的問題是與世隔絕? 天下, 20140711. [\[Web\]](#)

### Note

1. Start: 20120311
2. System Environment:

Listing 1.2.5.1 requirements.txt

```
1 sphinx==3.5.4
2 graphviz==0.19.1
3 pygments==2.7.4
4 sphinxcontrib-plantuml==0.23
5 sphinxcontrib-blockdiag==2.0.0
6 sphinxcontrib-actdiag==2.0.0
7 sphinxcontrib-nwdiag==2.0.0
8 sphinxcontrib-seqdiag==2.0.0
9 sphinxbootstrap4theme>=0.6.0
10 sphinxcontrib.httpdomain==1.8.0
11 sphinxcontrib.bibtex==2.4.2
12 sphinx-autorun==1.1.1
13 sphinx-copybutton==0.5.0
14 hieroglyph==2.1.0
15
```