InCiSE: applying RAP principles



The International Civil Service Effectiveness (InCiSE) project

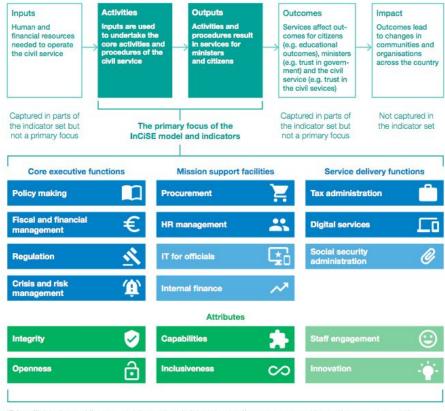
Matt Kerlogue Analysis & Insight Team, Cabinet Office

INSTITUTE FOR GOVERNMENT









IT for officials, internal finance, social security administration, staff engagement, and innovation are not currently measured in the InCiSE Index.

InCiSE takes data from a wide range of sources to assess the effectiveness of different civil services around the world



OPEN KNOWLEDGE

INTERNATIONAL

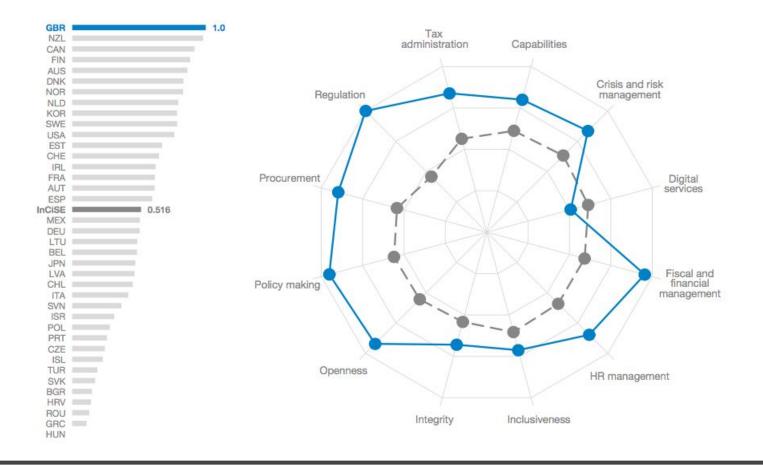


WØRLD ECONOMIC FORUM









The 2017 pilot edition

- A mixed workflow using **Excel** and **Stata**
- The source data for InCiSE is very messy manual transformations, transpositions and formulas, cumbersome to QA
- Excel → Stata → Excel workflow creates additional risks relating to how data is imported/exported
- Stata code is lengthy, difficult to understand, and re-run individual segments (all-or-nothing)
- Not easy to distribute or for others to reproduce
- Version control was/is a nightmare

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ders gium)	BEL	1.63104	0.48848	8.11949	1.13014	25.57728	2.15464	47.09987	2.13693	16.85127	1.97876	0.72105	0.44098	17.5723		Flanders (Belgium)	BEL	1.56868	2.33247	18.78909	6.44081	33.54638	8.34882	36,41835	8.14054	9.44932	5.06877	0.22818	1.03249	9.6775
	NOR	1.56684	0.41386	7.98762	1.03561	27.23238	1.55744	45.79695	1.55265	16.54528	1.18219	0.87094	0.29343	17.4162		Norway	NOR	4.13382	4.23486	4.5645	6.48201	46.04803	12.90768	29.48542	11.59926	15.76823	9.30205	0	0	15.7682
	OL.	1.72994	0.6141	9.4653	1.79868	32.55139	2.36288	41.18538	2.39386	13.77111	1.79816	1.29688	0.592	15.068		Poland	POL	4.56859	3.86622	15.50967	6.29939	27.86003	7.88227	41.97349	8.28463	9.59086	5.145	0.49735	0.99055	10.0882
ian ration	RUS	0.9874	0.66979	9.27587	1.6677	37.57332	2.98979	41.39332	2.67319	10.33638	2.26924	0.4337	0.41278	10.7701		Russian Federation	RUS	1.89193	5.17093	10.25148	9.58409	35.51514	18.74277	42.52022	19.01946	9.82123	14.59172	0	0	9.82123
ak ublic	WK	0.93363	0.42722	6.62877	1.23076	36.0687	2.30038	48.11363	2.25681	8.04553	1.59237	0.20975	0.27925	8.25528		Slovak Republic	SVK	4.19921	4.41906	8.40163	6.48974	43.20223	10.51375	39.76973	8.92514	4.42719	5.3385	0	0	4,42719
	SP	1.93301	0.76299	12.31592	1.75605	33.73115	2.23471	42.05348	2.55306	9.57804	1.34129	0.3884	0.34261	9.96644		Spain	ESP	5.69574	2.61763	20.68188	5.73412	47.28829	7.66255	23.98421	6.74341	2.34988	2.32357	0	0	2.34988
	SWE	1.68754	0.51507	8.09757	0.97614	28.38057	1.57435	45.28293	1.56489	15.22885	1.22608	1.32254	0.41942	16.5514		Sweden	SWE	0	0	6.90576	6.3859	40.6129	11.46735	34.7335	10.17011	14.83361	6.63201	2.91422	3.06708	17.7478
and (BR	1.6382	0.60916	8.61495	1.31613	27.79684	2.2847	43.37208	2.47993	17.48915	1.61378	1.08879	0.45152	18.5779		England/N Ireland (UK)	GBR	1.29493	1.76793	9.8828	4.6109	27.72234	7.75566	45.63631	8.63933	14.65246	5.50587	0.81116	1.82885	15,4636
d .	ISA	1.95333	0.78454	8.32094	1.8687	25.42845	2.39523	46.14507	2.65577	16.87555	2.05389	1.27666	0.53814			United	USA	0.14029	0.64288	9.86163	6.01541	29.44295	10.32509	36.43159	11.25116	23 99607	8.30344	0.12747	0.59034	
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0 Congo, Democratic Republic of the 1 Costa Rica	COD	CD	0	0	0 15594.63582	2.78725	-85 -3.22222 -2	KREEP	4 43	5 4.7777777	41000	4 44444**	3.4285716	-2.75	4			-3 28.52	29		0.54775	65366 0	76094 0.76027	0.08475 0.64407		-	
2 Cite d'ivoire	CIV	C1	0	0	0 3513.684726	3.17121	-6	-5 -4.8333	335	4 3.6666667	3.6666667	5.33333335	4.6666665	-4.4	3		43	1333	16		0.2582 0	57669 0	55524 0.39715	0.15254			-
3 Croatia 4 Cuba	HRV CUB	CU	6	0	1 21880.48421		-64 -3.44444 -3			5 4 8888888					229		-4.5	536			0.47546 0	63019 0	62542 0.56677	0.77966 0.32203	4	-	
5 Cypras 5 Crech Republic	CY7 CZE	CY	0	1	1 31116 31027	2.56297	-59 -4.6	-3.8 -3.9999	999 5.400000	4 5999999	3.8	4 8000002	4.1999998	-3.4 2	2.6	0		-3.8	6		0.000	enent -	74569 0.65999	0.52542	5	17.47	
7 Denmark	LINK	DK.	1	1	1 46623.71413	4.89673		19048 -7.3232	2.2 5.904761	8 5.9473686	5.5263157					0	-3.8	111 49.15 1714 76.62	52	0.50555556			74569 0.65999 99094 0.54102		9 57.091	12 626	3 14.3286 9 18.0435
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5 El Salvador	SLV	SV	0	0	0 8619.580946	2.15382	-76 -4.2	-4.2 -5.4000	4.5999999	9 4	3.2	5.4000001	5.5999999	-3.66667 2				4.2	27				56899 0.57936				
4 Equatorial Gainea 5 Entrea	CNQ E30	00 12	0	0	0 40718.82968		-6.66667 -6	33333 -2.5	-7 2.666666	2 2	3	7	7	-4 1.333	122			-7						0.01695			-
6 Estoria 7 Ethopia	EST ETH	11	t	1	1 27807.5119e 0 1628.923132		-38 -2.625 -35 -5.16667 -4	-2.5	-4 4.87	5 6	4.625	4.875	4.5	-3 4.8	875	2 1		-3.5 50.63 818 6.63	10	0.37916667	0.61922 0	76724 0	75102 0.75527 30456 0.40139	0.81356 0.49153	7 69.991	16.684	14.5422
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Why RAP?

Reproducible

Want others to be able to verify/repeat the work

Analytical ...

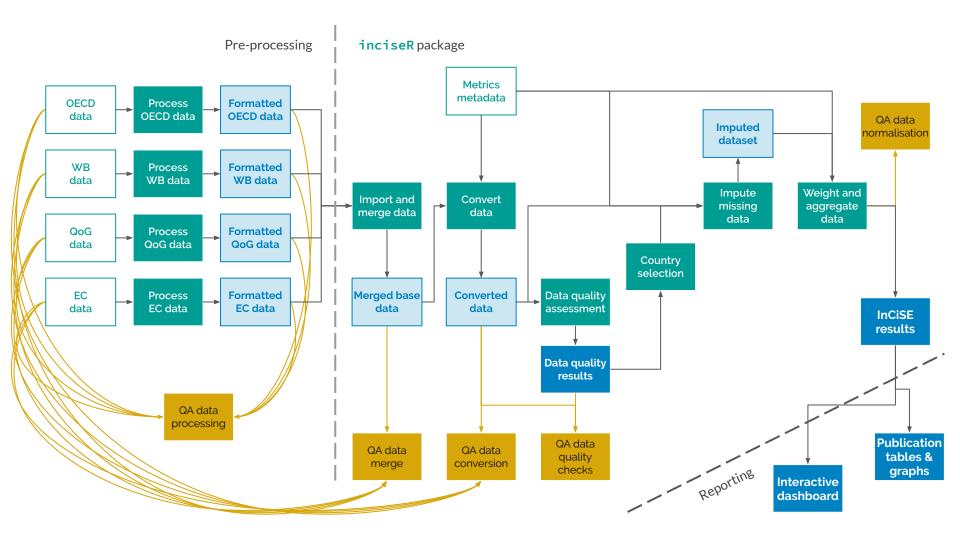
Pipeline Clear flow of inputs into outputs

Using RAP principles

- Data should be cleaned and processed by code no manual edits of source data
- Using only one app (**R**) reducing potential for error when switching from Excel to Stata and back again
- Using git for version control
- Wide array of really useful R packages to make
 - Data cleaning tidyverse, countrycode, janitor, readxl
 - Data processing tidyverse, mice (for imputation)
 - Non-spreadsheet data Rilostat, intsurvey, rvest, haven
 - Output ggplot, plotly, flexdashboard, jsonlite

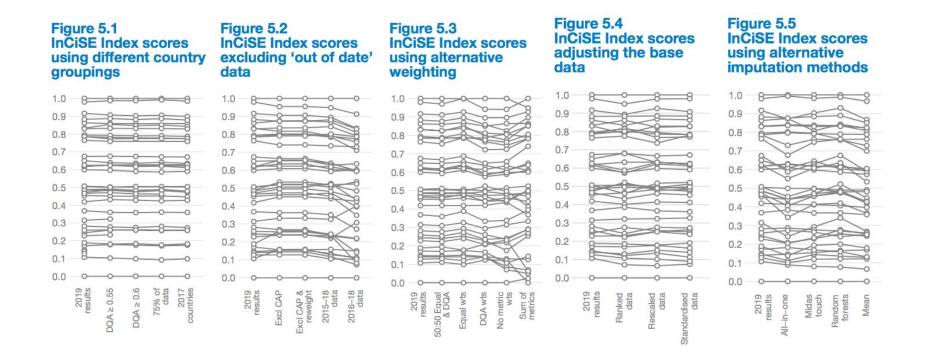
RAP in practice		Collate input data Clean and tidy data	Pre-processing
	4. 5.	"Import" tidy data Process tidy data Run analysis/models Produce outputs	inciseR package
	7. 8.	Reports & graphs	Post-processing

Obviously it didn't really happen like this!!



- (Good) Using git "offline"
 - Creating complex 'generic' functions
 - Packages aren't actually that scary
 - janitor and countrycode are amazing
 - **Plotly** won't replace **ggplot**, but is very versatile

lessons



Using RAP enabled 4x as many sensitivity tests to be undertaken

Package hell or how I learnt to love Microsoft

- InCiSE uses mice for multiple imputation a complex statistical package for estimating missing data
- Originally downloaded **mice** v2.4.6 in November 2017
- Laptop rebuild in late-January 2019 had to reinstall everything
- Meanwhile, **mice** updated to v3.0.0 in May 2018 (v3.5.0 in March 2019)
- Re-ran analysis figures didn't match !!!
- Eventually worked out it was **mice** we use in a v non-standard way (that the author doesn't recommend)
- CRAN only hosts source versions of old packages mice needs compiling, which I couldn't do.
- Microsoft CRAN "time machine" daily snapshot of CRAN with binaries! <u>https://mran.microsoft.com/timemachine</u>

Next steps

- Publishing the R package
- Developing countries work
- Transferring to one of our partner organisations R package makes that a lot easier
- Using as case study for transformation of Analysis & Insight's more regular work - FOI statistics, Civil Service workforce data, Civil Service People Survey...
 - Using R/Python and creating & automating flows
 - Using version control
 - In-built error checking/QA
 - DOCUMENT AS YOU GO !!!
 - Producing packages of regular functions

Useful links

- InCiSE reports: <u>https://www.bsg.ox.ac.uk/incise</u>
- InCiSE 'app': <u>https://incise-project.github.io/incise-app/incise-app.</u> <u>html</u>

 Civil Service People Survey analyst/data scientist (B2: HEO/SEO equivalent) <u>http://bit.ly/csps-analyst</u>