

Digitalization: Size doesn't matter, put focus on product-and-service, not on process

Mait Rungi¹

¹Estonian Entrepreneurship University of Applied Sciences, Tallinn, Estonia
(mait.rungi@eek.ee)

Abstract - Digitalization is opening new era in business as it provides clear advantages for companies to make the whole value chain customer and data centric, innovative, better quality, more convenient working conditions, less labor demanding, and more efficient. Despite of long list of potential benefits it is not known how good companies are to implement them and how it affects the performance. Quantitative data from 132 Estonian companies is used to reveal the impact. Estonia is European Union country known for high innovativeness and companies' emphasis on process improvements. Results indicate that process digitalization is not as important as product/service digitalization. Managerial decisions have more effect than staff activities. Impact on performance is surprisingly marginal. There is no size related variance.

Keywords - Digitalization, Estonia

I. INTRODUCTION

Digitalization has become buzzword and keyword of modern business and research. Historically it was more related with production and effectiveness, then now it has spread its scope to everywhere in same way like information technology has expanded throughout the history. Its start in production provided limited applicability as in accordance to value chain [32] the production part is less profitable (Smile Curve [36]), therefore it is welcome and logical to use benefits of digitalization in whole scope of value chain, not only in production stage. While there are lot of best-practices and practical advice available for implementing digitalization then there is still less evidence how usable is digitalization in general. Next research question is proposed:

- how much digitalization affects the performance?

Research is carried out in Estonia. Estonia is one of the smallest European Union member states, locating in Northern-Europe, next to Finland, Sweden, Latvia and Russia. Two largest majorities in Estonia are Estonians and Russians. Estonia is known by its high-technology orientation and e-solutions. The use rate and availability of mobile/smart phones and internet are high. Most of public services are available online, including e-voting in parliamentary elections, e-identification cards to give digital signatures, e-tax declarations and claims, e-health systems (incl. e-prescriptions) and countrywide mobile parking. Considering these country level preconditions, Estonia is considered appropriate context to test benefits of digitalization at companies' level, where companies are

known by start-up prevalence (including several prior/current unicorns Skype, TransferWise, Taxify/Bolt).

II. LITERATURE REVIEW

A. Digitalization

Digitalization is contemporary overwhelming trend "that is fundamentally changing existing value chains across industries and public sectors" [7](p. 29), these changes are not just technical automation [6], but also related with companies' social issues, including management and organization [4]. Due to multifaceted nature of digitalization and early stages of phenomenon, it is hard to be defined. In this research, digitalization is defined as "... the sociotechnical process of applying digitising techniques to broader social and institutional contexts that render digital technologies infrastructural" [40](p. 749). Digitalization has great potential, list of benefits of the digitalization is outstanding, including "automation of routine work", reduction of turnaround times, cut of costs [31](p. 67), increased efficiency, quality of product, environmental sustainability, workers' safety [27](p. 968), better use of knowledge [28] etc. There is also negative side of digitalization [28].

At current point of time, only fracture of potential of digitalization possibilities has been implemented, in Europe 12% and USA 18% [26]. Digitalization's improvements have been led by industries such as ICT, media and finance, in traditional industries the situation with digitalization is worse [26].

B. Components of digitalization and their impact on performance

Digitalization has wide effect on everything and this impact can include both, positive and negative side. In general, the impact is considered to be direct and positive [19], but there are also other outcomes. For instance, Vuori et al. [42] indicated that digitalization is not enhancing performance of knowledge workers, instead of their efficiency, mobility, asynchrony and co-creation, restraints such as information overload, time challenges prevail. Internationalization of companies has real affect how much digitalization helps the company turning the efforts to nothing [19]. Some have found inconclusive results [19][44].

Digitalization is seen to improve processes. For example, in maritime supply chain, it helps [9]. One form

of digitalization is Industry 4.0, which is seen to have organizational effect: “faster and better job”, “acceleration of organizational processes”, “place independent work system”, “facilitating control”, and “pressure of job” [46](p. 298). More and more companies are dealing with digital strategy, as “digital strategies focus on operational process efficiency” [8](p. 6) that connects strategy issue directly with performance. While top-managerial issues are related, then considering socio-technical nature of digitalization [40], there is reason to presume whole organization and its employees’ involvement [22]. Organizational affect is twofold, on the one hand, digitalization causes significant loss of low-skill jobs [16] that is being substituted by high-qualification positions [16][47], that makes the work with employees to be critical success factors: incl. digital mindset, leadership, “mobilizing the organization” [22]. On the other hand, paying attention to critical success factors helps the company. Cooperation impacts the digitalization at macro/world level [38] and at companies level [18]. Digitalization also influences new product and services and their performance [12].

Digitalization is connected with business processes, strategy, organization [30] and management [40] that all affect performance of the companies.

To sum up, the results of digitalization on performance varies.

III. METHODOLOGY

A. Questionnaire

The idea of the research is to find out how much digitalization affects the performance, this research question (i.e. ‘how much’) leads to quantitative research. While there are problems with measuring digitalization and its degree [12] the existing pre-validated questionnaires were searched and found, making the research setting positivistic, i.e. testing the theories/questionnaires. Majority of questionnaires are from practical managerial journals, not pure scientific, but widely usable by companies.

After analyze of found questionnaires, it turned out that none of questionnaires had full fit, so final questionnaire for independent variables was constructed on the basis of several questionnaires (Table 1). 5-step Likert scale with additional ‘I don’t know’ option was used.

Dependent variables are several performance indicators that were measured in scale of 3-step scale (1 – diminished, 2 – remained the same, 3 – increased, ‘I don’t know’). ‘Turnover’, ‘profit’, ‘market share’, ‘no of products/services’ and ‘amount of IT investments’ were chosen to be performance indicators. Usually standardized ratios are used for measuring the performance, but due to used scale there was no need for making them nominal or standardize.

TABLE I
QUESTIONNAIRE VARIABLES

Variable	Description	Source
client exp.	Client experience – the extent company uses digital channels for client relations, services, marketing and personalized offerings.	Fitzgerald et al. 2013, von Leipzig et al. 2017
prod./serv.	Products and services – the extent of digitalized products and services, and/or appendices of them.	Yoo et al. 2010, Matt et al. 2015
processes	Processes – the extent of digitalization of processes.	Westerman et al. 2011, Andriole 2017, Sebastian et al. 2017
strat. & mgt.	Strategy and management – the existence of digital strategy and support of management for digitalization.	Bonnet et al. 2015, Kotter 1995, Bharadwaj et al. 2013, Matt et al. 2015, Hess et al. 2016
org. & coop.	Organization and cooperation – awareness of digitalization goals, existence of skills for digitalization, and the extent to use digital solutions in cooperation with partners.	Westerman et al. 2011, Kane et al. 2015a, Fitzgerald et al. 2013, Legner et al. 2017

Modified from [20].

B. Data gathering

In accordance with country statistics, the size of population in Estonian companies, that have shown some turnover in 2018 is 131 650 [37]. Majority of them are at micro (93.99%) or small level (4.97%), only few at medium (0.89%) or large level (0.14%). Expected sample size for good generalizability is 383 (confidence level 95%, confidence interval 5%) [34]. It was random sample, that was constructed on the basis of [17] (Äripäev, Bonnier Group). Infopank database holds contact information of companies, including managerial contacts. Google Forms platform was used to construct the questionnaire. Questionnaire was sent to 1000 contacts to get expected sample size with 30-40% response rate, that would allow to generalize results to whole country. Data gathering period was Nov 19 – 30, 2018, during the period, two reminders were sent. In total, 132 responses were collected making the response rate to be 14.25%. Majority of respondents by position were top managers (n=100), rest of the respondents were medium managers (n=21), low level managers (n=7) and specialists (n=3). See division by size in Table 5.

IV. RESULTS AND DISCUSSION

A. Quality

Data analysis was performed by SPSS 22 and 25. Cronbach Alpha, indicator of internal consistency was measured for digitalization components, independent variables of the research. Cronbach Alpha values for all the components were above the accepted threshold 0.7 [10][29](p. 87) (see Table 2), so the construct is successfully proved.

TABLE II
CRONBACH ALPHA

Variable	Cronbach Alpha
client exp.	0.773
prod./serv.	0.771
processes	0.827
strat. & mgt.	0.906
org. & coop.	0.842

B. Descriptive statistics

Descriptive statistics are brought out in Table 3. Variables of digitalization indicate average values in 5-step Likert scale ($3.23 \leq M \leq 3.55$), while performance indicators are positive in 3-step Likert scale ($0.40 \leq M \leq 0.73$). When the mean values of digitalization values are rather similar then companies vary in their responses a lot – from good to great ($0.755 \leq s.d. \leq 1.294$). Same way, companies' performance vary at large extent ($0.533 \leq s.d. \leq 0.766$). Correlations show that there are two high correlations between digitalization variables: $r_{\text{processes-organization}}=0.719$ ($p < 0.01$) and $r_{\text{strategy-organization}}=0.745$ ($p < 0.01$), these two and rest of medium level coefficients between digitalization components indicate that they go hand-in-hand with other digitalization components. Conclusion can be drawn, companies rarely concentrate on one field in

digitalization. Surprisingly, digitalization and performance seem to have insignificant and low correlation [19][44], digitalization is like hygiene factor (see Herzberg's 1966 hygiene factors for background), something that is must have for everyone, but not ground for helping companies further.

C. Impact on performance (regression)

As the regression bases on correlation then regression analyses confirm the same (Table 4), but they also describe how much variance of dependent variable (performance) is explained by independent variables (digitalization). Digitalization describes just few percent of performance ($2\% \leq R^2 \leq 5\%$), but digitalization helps to provide more to the number of products and services ($R^2=7\%$) and especially to make further IT investments ($R^2=16\%$; $p < 0.01$). Only consistently positive and highest impact on performance comes from support of management ($0.147 \leq \beta \leq 0.292$), so top-down approach is important. Surprisingly, products and services get affected negatively from digitalization ($-0.174 \leq \beta \leq -0.044$) [12], expect affect to IT that is expectedly positive.

TABLE III
CORRELATION

No	Variable	M	s.d.	N	1	2	3	4	5	6	7	8	9	10
					client exp.	prod./serv.	processes	strat. & mgt.	org. & coop.	turnover	profit	market share	no of prod./serv.	IT invest.
1	Independent	client exp.	3,49	1,040	132	1								
2		prod./serv.	3,23	1,294	131	,475**	1							
3		processes	3,41	1,096	132	,506**	,541**	1						
4		strat. & mgt.	3,55	0,934	132	,498**	,576**	,686**	1					
5		org. & coop.	3,60	0,755	132	,539**	,591**	,719**	,745**	1				
6	Dependent	turnover	0,73	0,568	128	,072	,020	,075	,166	,083	1			
7		profit	0,45	0,776	126	,021	-,063	,011	,060	,022	,548**	1		
8		market share	0,40	0,584	121	,007	-,032	,072	,139	,113	,524**	,462**	1	
9		no of prod./serv.	0,45	0,559	127	,225*	,086	,056	,168	,117	,374**	,132	,535**	1
10		IT invest.	0,51	0,533	125	,163	,316**	,292**	,377**	,305**	,255**	,265**	,194*	,165

TABLE IV
REGRESSION

No	Variable	M	s.d.	N	turnover	turnover 2017	profit	market share	no of prod./serv.	IT invest.
1	client exp.	3,49	1,040	132	,030	-,071	,031	-,060	,239	-,084
2	prod./serv.	3,23	1,294	131	-,101	-,105	-,149	-,174	-,044	,160
3	processes	3,41	1,096	132	-,036	,244	-,026	-,025	-,170	,043
4	strat. & mgt.	3,55	0,934	132	,272	,154	,147	,198	,201	,292
5	org. & coop.	3,60	0,755	132	-,050	-,126	,003	,119	-,012	,007
	R ²				,038	,051	,019	,044	,073	,161
	F				0,969	1,350	0,452	1,059	1,885	4,545

TABLE V
ANOVA

No	Variable	Sample	N	M	s.d.	F	
1	client exp.	1-9	22	3,94	0,883	3,794	*
		10-49	67	3,23	1,035		
		50-249	31	3,55	1,016		
2	prod./serv.	1-9	22	3,32	1,140	0,520	
		10-49	67	3,11	1,322		
		50-249	30	3,27	1,324		
3	processes	1-9	22	3,36	1,159	1,333	
		10-49	67	3,26	1,170		
		50-249	31	3,68	0,905		
4	strat. & mgt.	1-9	22	3,43	0,825	1,972	
		10-49	67	3,44	0,976		
		50-249	31	3,90	0,762		
5	org. & coop.	1-9	22	3,76	0,821	0,877	
		10-49	67	3,51	0,779		
		50-249	31	3,72	0,685		
6	turnover	1-9	21	0,38	0,805	3,866	*
		10-49	66	0,83	0,450		
		50-249	30	0,80	0,484		
6	turnover 2017	1-9	22	4,45	2,132	23,480	***
		10-49	67	6,31	1,635		
		50-249	31	7,77	0,425		
7	profit	1-9	21	0,24	0,889	1,656	
		10-49	65	0,55	0,708		
		50-249	30	0,50	0,777		
8	market share	1-9	21	0,19	0,680	3,497	*
		10-49	60	0,52	0,504		
		50-249	30	0,43	0,568		
9	no of prod./serv.	1-9	21	0,29	0,644	0,732	
		10-49	65	0,49	0,534		
		50-249	30	0,47	0,571		
10	IT invest.	1-9	20	0,40	0,681	0,521	
		10-49	64	0,53	0,503		
		50-249	30	0,50	0,509		
		>250	11	0,64	0,505		

D. Size difference (ANOVA)

Anova results (Table 5) indicate surprisingly that there are few size related variations, while literature indicate that small companies are “flexible and faster” to implement and large companies “more experienced” and “bigger capital” [13]. Only variable that is getting significantly higher in bigger companies is client experience.

V. CONCLUSION

There is need to check out whether digitalization is fad or does it really help to get companies better. Companies can get better in various ways, one common way is to check whether the companies that practice digitalization have better performance than other. The effect of digitalization was tested on 132 Northern-European – Estonian

companies

This research concluded with several results. First, process digitalization is not as important as product/service digitalization, but unfortunately majority of Estonian companies practice process innovation [33]. Secondly, managerial top-down decisions have more effect on performance than staff activities, again, unfortunately management need to be convinced by staff first when they take initiative [39]. Thirdly, impact on performance is surprisingly marginal and inconsistent. Lastly, there is no size related variance, it is not so that big companies have more sources to digitalize. Nowadays, small and large companies have equal capability to run innovation, see start-ups for detail.

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