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Anna Zaytseva, Olga Shuvalova, Dirk Meissner

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Anna Zaytseva¹, Olga Shuvalova², Dirk Meissner³

USER INNOVATION - EMPIRICAL EVIDENCE FROM RUSSIA

Innovations are commonly seen as resulting from the commercialization of new ideas and technological goods by dedicated organizations, especially firms. This conception is reflected in a producer-oriented approach to science, technology and innovation policy-making (STI). However a new understanding of the role of users within innovation processes is gradually taking shape, with profound policy implications. User innovations are often not based on technological improvement or R&D and remain largely under-estimated. Although there are many case studies of user innovators at the industry level, the role of users is not captured by general statistics on innovation. Up to now the only exception is the empirical evidence-based study of user innovation carried out in the UK in 2009. Recently it was complemented by empirical data from the USA and Japan. The present article aims to contribute to closing the gap of empirical data on user engagement into innovation activities at cross-country level. The analysis is based on the results from a national survey carried out in Russia in 2011. The findings contribute to the better understanding of user innovators profile and of the factors which underpin user innovator activities in the context of emerging economies.

The article is organized as follows. The first section reviews the relevant literature on the user innovation concept and the main features of user innovations as compared to producer-generated innovations, as well as on the measurement of user innovators. The second section presents the research methodology and the main empirical results. Finally, the paper discusses some of main analytical and policy implications of the empirical findings.

Keywords: User Innovation, Innovation Sources, Open Innovation, Innovation Management, Demand Driven Innovation

JEL classification: L21, M10, M14, M31, O21, O32, O33

¹ PhD candidate in political sciences, Centre d'études de la vie politique, Université Libre de Bruxelles

² Research Fellow, Institute for Statistical Studies and Economics of Knowledge, Laboratory for Economics of Innovation

³ PhD, Deputy Head, Laboratory for Science and Technology Studies, Institute for Statistical Studies and Economics of Knowledge, National Research University Higher School of Economics, dmeissner@hse.ru

I. Literature review

1. User innovation concept

Over the last decades understanding of innovation and its impact on national welfare has changed considerably. Globalization and changing business models along the value chains have radically changed production of goods and services. The latest trends in socio-technical environment encourage an accelerated development of user innovation. These changes are due to spread of computer and modular design, access to affordable tools of communication, active dissemination of digital media, etc. [Baldwin, von Hippel, 2009]. The potential of crowd-sourcing for instance is another quite influential discussion which also stems on the acknowledgment of greater user capacity to be involved in problem-solving process.

The innovation studies were recently complemented with new insights on the systemic patterns of innovation generation. A qualitatively new step in understanding innovation specifics was the recognition of high interactivity and multidisciplinary of this process [Grosfeld, Rolandt, 2008] under a new concept of "open innovation» [Chesbrough, 2003] and "user innovation» [von Hippel, 1986]. According to these approaches, innovation has to be understood as a process which is more and more developed out of one organization, country or discipline and requires the development of adequate management and policy tools.

User innovation is understood as the result of all activities relating to innovation which are initiated and/or completed with active involvement of users. "User-innovators are firms or individual consumer that expect to benefit from using a novel product or a service they develop" (NESTA, 2010). In contrast to producers, they do not benefit from selling the product or service. An important body of literature provides quite a significant elaboration on the peculiarities of user innovations which make them different from innovation generated by producers and offer new policy prospects. De Jong and von Hippel summarized the main differences between "producer" and "user" innovation as outlined in Table 1. First of all, as stated in the early works of E. von Hippel [von Hippel, 1979; 1986] and confirmed by further research, the main difference is the initial motivation to innovate. User innovators are individuals and businessmen who initiate an innovation to solve a certain problem and benefit from the use of innovative design, product or service [Gault, von Hippel, 2009]. Producers- innovators tend to benefit from the sale of innovation [ibid].

Table 1. Main differences of innovation-driven manufacturers of innovations created by users

	Innovations initiated by producers	Innovations initiated by users
Benefits from innovation	From innovation sale	From the use of innovation
The motivation for innovation	Possibility	Necessity
Dominant type of actors	Mostly organizations (companies, public research organizations working on their own)	Mostly individuals, including end-users
Dominant type of knowledge	Information on solution	Information on needs
Dominant type of innovation	Quality, reliability and design improvement	Functional novelty
Stage of industrial / production cycle	Stage of developed production (industrial phase)	Initial phase (emerging industry)
Mechanisms for innovation diffusion	Commercial basis (sales, licensing)	Dissemination on a volunteer basis (free exchange of information in the user community, etc.)

Source: [de Jong, von Hippel, 2010].

The crucial aspect relates to the fact that unlike users the producers' objective is to ensure return on investment. The intensity of user producer interaction is a determinant of the potential of innovations. This has been found especially for emerging technologies (Moors, Nahuis 2009). Although this is known and has been proven it remains unclear which type and which intensity of interaction is essential and which is the optimum in both (Moors, Nahuis 2009). Accordingly, their innovation focus on products and services that meet the established market demand and the related innovation is aimed at improving quality, reliability and product design and commercialization while meeting specific demands of a homogeneous market segment. As for user-innovators, they modify or create new products and services to meet their diverse needs that are not satisfied by the market offer. They carry out their innovative activities in the informal (non-professional) context and usually do not have access to proper technical equipment, so according to von Hippel, their work is usually more focused on bringing functional innovation in products or services, so that user innovation lead to generation of new markets [de Jong, von Hippel, 2010].

In a study on new types of innovations, E. von Hippel identifies a special type of "lead users" who anticipate the emergence of new products on the market and recognize the needs of users which were not met by the existing offer on the market. Their needs are so new and

specific that there might be no available standardized technology solution to satisfy them. Lead users generate new solutions before the stage when potential producers can have an idea of a market size which in return could motivate them to invest into a new solution. E. von Hippel defines lead users as individuals or companies who meet simultaneously the two following conditions [von Hippel, 1986]: (1) they expect attractive innovation-related profits from a solution to their needs and so are likely to innovate; (2) they experience needs prior to the majority of a target market. Empirical studies have shown that innovations are more likely to be concentrated amongst lead users (Urban and Von Hippel, 1988; Franke, von Hippel, Schreier, 2005). Hence, this type of consumers is different from 'early adopters' defined as the first customers of innovative products or services since they are not only at the leading edge of consumption but also solution generation. Lead users cannot or do not want to wait until a better solution becomes available on the market.

Further diffusion of user innovations is often accompanied by community members who pursue the exchange of experiences contributing to innovation improvement. It has been documented that users reveal their information at no cost (economy of free revealing) [von Hippel, Finkelstein, 1979; Ramond, 1999; Nuvolari, 2004; Morrison, Roberts, von Hippel, 2000; Franke, Shah, 2003, etc. - op. under Art. [De Jong, von Hippel, 2010]]. Sharing information helps user to improve their own experience by integrating comments and suggestions from the community. In certain cases free revealing of information can bring additional benefits as it increases user-innovator reputation within the community. Studies suggest that every fourth user innovation is diffused either among other users or among producers [de Jong, von Hippel, 2010].

At a certain point the innovation may be commercialized and the producers can join the venture. Generally, at this post-experimental stage the design and the niche for the product are identified. Most often, user innovations are distributed by the developer himself: the user-innovator becomes an innovative entrepreneur who commercializes his invention. In addition, their diffusion also operates through "open innovation" channels in which the company instead of conducting its own research and development uses out-sourcing can adopt innovative products and services which are popular among users but are not yet present on the market ("innovation gap").

According to different studies conducted, user innovation has a significant potential for commercialization which enhances the rationale of developing user-oriented measures of public and corporate support. Personalization and co-creation with customers is presented as a strategic principle of innovation management as it enables companies to respond better to consumer needs [Huffman, C. and Kahn, B.E. (1998); Salvador, F., Forza, C. and Rutgtusanaham, M, 2002]. Furthermore, greater use of user innovation in the sector of knowledge-based services can to

some extent reduce the risks associated with asymmetry of information in service sector and overall, stimulate development of this sector [Doroshenko, 2010; Zaytseva, Shuvalova, 2011]. Last but not least user innovation model is particularly interesting for the development of inclusive innovation model as it enables to mobilize "traditional" and uncodified knowledge (grass-roots innovations), to promote technology development in the informal sector conditions – in other terms, to promote bottom-up innovation [Douthwaite, Keatinge, Park, 2001; World Bank, 2010].

For all the above-mentioned reasons, S&T and innovation policy has to consider user innovation in order to supplement producer-oriented tools and to maximize benefits for the economy via stimulation of demand-oriented policy. Typically, recommendations are aimed at stimulating demand [de Jong, von Hippel, 2010] or human capital development. Yet, the state of measurement of user innovation does not enable to design concrete policy initiatives at the current stage and studies of user innovation characteristics at large do not provide a comprehensive view on the profile of user-innovators.

2. Empirical studies on user innovation

As stated above, as a phenomena user innovation has been documented in scientific studies but has not become a subject of public statistics of innovation activities yet. The current statistical data available is based on traditional producer-oriented model of innovation. Hence, there is no indicator of consumer innovation in official surveys as the focus of S&T. Established metrics of innovation rely on measuring R&D activities (mainly via indicators on R&D expenditure) and its commercialization (via patents and publications). This does not allow considering the existing variety and scope of innovation activities leaving aside all the benefits which can be brought by active user engagement. For instance, within the OECD approach, consumer role is reduced to information provider. Moreover, the data collection process is designed in such a way that it captures only the producer point of view as all the surveys are addressed to producers. Hence the existing data does not allow reflecting the nature of innovation and information transfers among users adequately.

Yet, as described above, user innovation is not a marginal phenomenon to be ignored. Pursuing the pioneer works on user innovation led by Eric von Hippel, numerous researchers identified user innovation in consumer services, in industry and even in service sector (cf. the table 2). The extensive list of user innovations includes new semiconductor equipment, improved technology refinery, not to mention the multiple products developed on the basis of Internet technologies (free open-source encyclopedia "Wikipedia", image and video hosting website

(Flickr), video-sharing website (YouTube), etc. [Gault, von Hippel, 2009]. The studies cited above provide empirical evidence that user innovations emerge in different sectors of the economy and that the share of innovative products developed by users is quite significant. In addition to that, according to E. von Hippel estimations, from 10 to 40% of consumers are developing new products or services or improve existing ones [von Hippel, 2005]. According to exit polls, among small business the share of innovative user reaches 15-20% [de Jong, von Hippel, 2010], and to end-users - 8% [NESTA, 2010].

Table 2. Examples of products and services that have resulted from innovations initiated by users

<i>Authors of the research</i>	<i>Year</i>	<i>Innovations studied</i>	<i>Share of products/services developed for inner usage (according to the results of the study)</i>
von Hippel	1976	Scientific instruments	<i>No data</i>
von Hippel, Finkelstein	1979	Medical instruments	<i>No data</i>
Freeman	1986	Innovations in refinery sector	<i>No data</i>
Urban, von Hippel	1988	Soft for printing schemes	24.3%
Herstatt, von Hippel	1992	Pipeline equipment	36%
Morrison et al.	2000	Information library equipment	26%
Shah	2000	Sports equipment	<i>No data</i>
Luthje	2002	Mountain bike equipment	19.2 %
Luthje	2003	Surgery equipment	22%
Franke, von Hippel	2003	Apache OS server software security features	23%
Franke, Shah	2003	Equipment for extreme kind of sports	37.8%
Luthje	2004	Consumery products	9.8%
Oliveira, von Hippel	2009	Banking services	<i>No data</i>

Sources: [Jin, von Hippel, 2009; NESTA, 2010; de Jong, von Hippel, 2010].

With regard to individual empirical studies, the first attempts at developing new techniques for measuring innovation in this field have been undertaken in Canada (innovations initiated by users in high-tech industry) [Shaan, Uhrbach, 2009; Gault, von Hippel, 2009 - - op. under Art. [De Jong, von Hippel, 2010]], Netherlands (Project for Development of Small and Medium Enterprises) [de Jong, von Hippel, 2008; 2009], the UK (the study of innovation among final consumers - individuals and companies) [NESTA, 2009].

A big share of work was devoted to the study of lead users. Multiple studies have revealed that lead user methods contribute to the development of commercially attractive new

products (Urban and von Hippel, 1988; Herstatt and von Hippel, 1992; Olson and Bakke, 2001; Lilien et al. 2002 as cited in [Franke, von Hippel, Schreier, 2005]).

The first study on user innovation at the national level which targeted end-consumers was carried out in the UK in 2009. Similar follow-up surveys were carried out in the USA and Japan by the same team of authors in 2010 [Ogawa, Pogatanalet, 2011]. The peculiarities of each survey are discussed in the next section in comparison with our research methodology. Yet, it is to be noted that the British survey covered both user innovation at the individual level (consumer level) and at the firm level⁴. The surveys which were carried out in the US, Japan and Russia were intended to explore the importance of consumer-level innovation.

The first survey targeted at end-consumers older than 18 and focused on examination of creation and modification of physical products used by consumers⁵.

The second round of surveys enabled to ensure the sample cleaning in two steps. The innovations claimed were checked in terms of their originality, as well as in terms of degree of innovation (Ogawa, Pogatanalet, 2011). Examination of written descriptions on user innovation reported led to exclusion of a large number of innovations. All cases of innovations which were developed as part of a job were excluded. For the UK survey reported innovations which were homemade replicas of products already available on the marketplace were also excluded. Modifications and improvements which were anticipated by manufacturers (such as software upgrades, etc.) were also excluded as the study aimed to provide data on truly novel products. So far, this additional cleaning process constitutes an important difference as compared to our methodology described above. However, the aim of this paper is not to provide a thorough comparative study of user innovation phenomena in different countries, but to provide first empirical data on it in Russia and to underline the uncovered dimension of factors which underpin user innovation in emerging economies. Yet, as it is mentioned above, sample cleaning is a necessary step for further thorough research on user innovation.

II. Research methodology

Our study is aimed at measurement of user-innovators population in Russia and further advancement in understanding of patterns which determine user-innovators' activities. The main focus of the study is individual end-consumers. Empirical study of user-innovators' at the firm

⁴ The firm-level survey was built on similar studies conducted in the Netherlands and Canada, adapted to the UK context and enlarged to firms from a broader sample of industrial sectors. The survey sample included 1004 firms from a structure sample which was representative of the UK economy. The respondents had to answer a set of questions on user innovation which was disaggregated into "modification of externally acquired technologies" and "creation of new technologies from scratch".

⁵ The UK survey distinguished between "software products" and "physical products", while the other ones, including the one used in our research, did not make this distinction.

level would require a different sampling and techniques to be used. The interest of our research was also to collect the first data on user innovation phenomena in Russia and based on the findings, to design further research tools targeted at companies and policy design.

Our survey was launched in 2011 and due to budget limitations it consisted of a series of questions within a larger monitoring survey on the innovation behavior of Russian population conducted in the framework of the Basic Research Program of the National Research University Higher School of Economics. The representative sample of the survey included 1600 respondents older than 18 years and it covered 130 settlements from 45 Russian regions (both urban and rural settlements). The survey was designed by the authors and was conducted with the help of the analytical research center called “Levada-center”. The size of the sample is thus comparable other empirical studies conducted in the UK, USA and Japan (1171, 1992 and 2000 respondents accordingly).

Our sampling was different from the previously mentioned as it targeted the population from different settlements across the country (big cities, large cities, small towns and villages). It has been assumed that in Russia these differences can impact a lot consumption models, innovation opportunities and needs.

The two surveys were focused on product innovation. The question which was asked to identify user innovators was the following: « Have you ever created new devices, technical equipment for personal consumption (for you, your family and friends) or to improve something amongst technical devices you have?». It is to be noted that this formulation of the questions limits in a way innovative products to devices and technique-based products. Hence the findings do not include innovation in services, marketing and organizational innovations.

In our research distinguished people who innovated more than five years ago («old user-innovators») from those who innovated less than five years ago («new user-innovators»). The latter analysis of results showed that these two groups had different kinds of behavior. We also presume that if the innovative products were defined in broader terms, it would lead to increased share of user innovators at the country level. Yet, our narrow focus can be explained by the fact that the study was limited to a survey which required closed formulations.

The questions were built around the following blocs: 1) share of user-innovators and their socio-demographic profile; 2) motivation for innovation activity at home; 3) demand for innovative products; 4) interest for innovative products; 5) channels of information diffusion used by user-innovators.

III. Research findings

Share of user innovators

Our study shows that 1,1% of respondents created new devices in Russia in the last 5 years while 3,4% of respondents were engaged into product modification activities. 3,3% respondents reported to be involved into innovation activity more than 5 years ago. In total we defined the share of user-innovators as the sum of these three groups, so 7,8% of Russian population are considered as user-innovators. 88,3% of respondents reported that they had never done anything similar, while 3,9% of respondents found difficulty in replying⁶ (Table 3).

Table 3: Share of user-innovators in Russia

«Have you ever created new devices, technical equipment for personal consumption (for you, your family and friends) or to improve something amongst technical devices you have?»

	Share of respondents,%	Number of respondents
I have created new devices (1)	1,1	18
I have modified or improved devices (2)	3,4	55
I have created new devices/improved devices more than 5 years ago (3)	3,3	52
No	88,3	1412
Found difficult to reply	3,9	63
Total for user-innovators (1+2+3)	7,8	125
Total	100	1600

Socio-demographic profile

Given the relatively small sample of user-innovators group we cannot proceed to detailed quantitative analysis, so at this exploratory stage we are limited to highlighting some of user-innovator features on qualitative level.

According to the results, two thirds of user-innovations are men. Their share is even more significant among those who had done innovations more than five years ago (3/4 of respondents) and among those who created new device (4/5 of respondents) (Table 4).

Representatives of this group have higher level of education: almost two thirds of respondents have secondary vocational or higher vocational education (as compared to 50% in the overall sample of respondents) and very high level of involvement into educational activity. 40% of user-innovators were involved into life-long learning activities in the last four weeks preceding the survey as compared to the average share of 19.

As for their professional occupation, 28% of user-innovators are qualified laborers, 20% of them are specialists and 23% of them are retirees. Their age distribution is not significantly different from the average age structure in Russia. Yet, we can notice that younger people are

⁶ The respondents from this group reported to «find difficulty in replying» to multiple questions from the larger survey on innovative behaviour of Russian population and generally given their answers to other questions on user-innovators aspects, they are closer to the non innovative share of users.

more present within the group who did innovations less than five years ago («new» user-innovators), whereas there are older people within the group who did innovations more than five years ago («old user-innovators»). As for the estimates of socio-economic income, user-innovators do not differ from the average respondents. The incomes of new user-innovators are slightly better than those of the «old» ones.

These findings are again consistent with other empirical studies which revealed that men were more represented amongst user-innovators than women, and that user-innovators had generally higher level of education and employment. Yet, it can be noted that in Russia the group of respondents from 18 to 24 years old is involved into innovation activities less than the other age groups, whereas it is not the case for the UK⁷.

Table 4. Socio-demographic profile of user-innovators (as % of respondents for each group).

		User-innovators					All respondents
		All	who did innovations ...				
			less than 5 years ago			More than 5 years ago	
			All	Created new products	Improved existing products		
N (Number of respondents)		125	73	18	55	52	1600
Gender	Men	66	74	81	72	54	45
	Women	34	26	19	28	46	55
Level of education	Tertiary A and higher	27	29	37	26	25	21
	Tertiary B	33	34	26	36	31	29
	Upper secondary	13	12	5	14	15	18
	Lower secondary	27	25	31	23	29	33
Age	18-24	9	11	18	9	5	15
	25-39	33	33	36	32	33	27
	40-54	29	33	26	35	24	30
	55 and older	29	23	20	24	39	28
Professional occupation	Independent entrepreneur	2	2	0	2	3	3
	Manager	3	4	0	5	2	3
	Expert	18	20	9	24	14	13
	Military officer	1	1	0	2	0	1
	Customer officer	10	9	13	7	11	9
	Laborer	28	29	36	27	25	31
	Student	3	5	8	4	2	4
	Retiree	23	17	20	16	32	24
	Pensioner disability	2	3	0	5	0	1
	Housewife	5	4	11	2	6	6
Unemployed	5	6	4	7	5	5	
Participation in learning	Participation in lifelong learning in the last four weeks*:	40	43	46	42	35	19
	Participation in education and training	24	29	41	25	16	9
	Participation in informal learning	35	37	35	38	31	16
Family income	A	3	2	6	0	4	6

⁷ The UK results showed that the younger the age group is, the bigger is the share of user-innovators (although the difference amongst groups does not exceed 1% and given the size of the sample it may be due to statistical error.

distribution**	B	21	17	10	19	27	23
	C	56	59	64	57	53	55
	D	19	22	19	23	15	15
	E	1	1	0	2	0	1
Type of settlement ***	Moscow	8	5	0	7	11	7
	Large cities	20	19	15	20	22	21
	Middle cities	27	30	37	28	23	20
	Small towns	20	19	6	24	22	26
	Villages	24	26	42	21	22	26

* Methodology is harmonized with Eurostat research on Lifelong learning - LFS data
<http://epp.eurostat.ec.europa.eu/portal/page/portal/education/data/database>

** A – We hardly get enough money to subsist, we lack it even for food; B – We have enough money to buy food but purchasing clothes gets us into financial difficulties; C – We have enough money for food and clothes, but it is not easy to buy durable goods; D – We can easily purchase durable goods but not really expensive ones; E – We are able to buy expensive things such as flats, summer-houses, etc.

*** Large cities: over 500 thousands of people; middle cities: 100-500 000; small towns: under 100 000 people.

An additional dimension of our research brought interesting results on distribution of user-innovators across different types of settlements. «New user-innovators» live more often in middle and small settlements, whereas «old innovators» can be more often found in big cities. 27% of user innovators live in the middle cities (as compared to the 20% at the average level) and this share is even bigger if we look at user-innovators who created new devices: 37% of them lived in the middle cities (as compared to 30% at the average level) and 42% of them lived in the village (as compared to 24%). This can lead us to suggest that there is non linear relationship between user-innovation activity and type of settlement. So far we note that users who created new products are 1,85 times more present in middle cities and 1,6 times more present in villages.

Motivation for user innovation activity

To explore the sources of motivation of user-innovation motivation we formulated our question as followed: «What was the main cause which motivated you to create a new device or modify an existing one?»⁸ The respondents had to choose between two options provided: either the devices required were not in sale or they are too expensive. We provided these options to test the assumption about user motivation presented in Section 1. The prior theoretical and empirical studies postulate that users innovate because of necessity and because the product required is not present on the market. Our aim was to challenge the second condition and to provide an alternative explanation for innovation activity which consists in price compensation.

Two thirds of our respondents reported that they were motivated to innovate because the products required costed too much and only one third of user-innovators were motivated to engage into innovation activity because the devices were not available in sale (Table 5). We can

⁸ This question was addressed only to those respondents who did innovations less than five years ago.

thus understand that motivation to compensate the price inadequacy led more often to modification of existing devices (81%) than to the creation of something new (19%) as innovative users in questions were expecting to replicate a concrete concept of the product they were looking for. In case when users were motivated to innovate because the item required was not sold out in shops, the proportion of creation from scratch and of modification of existing devices was almost equal (54% against 46%).

It is interesting that the findings in the UK and Japan also revealed a higher share of engagement into modification activities than into creation of new products from scratch (4,5% and 2,1% of respondents respectively reported to modify the software or physical products they use, while 2,1% and 1,7% created from scratch⁹). The difference in proportion can be due to the methodological differences in user-innovators selection. The studies conducted in the UK, USA and Japan were aimed at identification of truly novel product and as mentioned above multiple replication cases were excluded at the second stage.

Yet, the two consumer level findings show similar trend which consists in higher frequency of modification activities.

Table 5. Motivation of user-innovators (share of respondents, %).

		User-innovators				All respondents
		All	who did innovations less than 5 years ago because the products required...			
			All	are not sold out in the shops	are too expensive	
N (Number of respondents)		125	73	21	45	1600
Family socio-economic income*:	A	3	2	0	3	6
	B	21	17	5	18	23
	C	56	59	60	64	55
	D	19	22	30	15	15
	E	1	1	5	0	1
Type of settlement*:	Moscow	8	5	4	7	7
	Large cities	20	19	0	31	21
	Middle cities	27	30	36	24	20
	Small cities	20	19	28	10	26
	Villages	24	27	32	28	26
Type of innovations:	Creation of new devices	15	25	46	19	1
	Modification/Improvement of devices	44	75	54	81	3

DA = did not ask

* Cf. the footnote for Table 4.

Finally, it has to be noted that motivation differs across types of settlement of the responding users. Users who were motivated to innovate because the items required were not sold out in the shops are from middle, small cities and villages. In these settlements in Russia the

⁹ It is interesting that in the case of the USA there were however 0,1% more users who created from scratch (cf. table 9).

market is significantly less saturated with products than in large cities and especially in Moscow. The motivation to innovate because the product is too expensive is therefore almost equally shared across different types of settlements, and the biggest share of people with this motivation can be found in large cities and villages.

Demand for innovative products

If we examine the set of questions related to the demand for innovative products, user-innovators seem to be amongst the earliest consumers of innovative technical products. As shown above in the Table 6, their household is generally equipped better than the average for ten out of thirteen products.

User-innovators also have higher level of demands. In order to compare the demands for a particular product we added the share of respondents who reported to possess already a product with the share of respondents who reported that they would like to purchase the product if they had sufficient resources for that. According to the findings, for five items user-innovators express stronger level of demand than in average (digital photo and videocameras, Internet access, 3-D TV, dishwashing machines, air cleaners).

Table 6. Technical equipment of a household and user-innovators' demands (share of respondents of each group, %)

	Technical equipment		Demand for technical products	
	New user-innovators*	All respondents	New user-innovators*	All respondents
N (Number of respondents)	73	1600	73	1600
Mobile phone	89	91	94	94
Flat TV (LCD, plasmic)	50	38	66	66
3D-TV	5	4	31	23
Cable TV	33	39	46	48
Satellite antenna	24	16	35	32
Digital camera or videocamera	50	43	62	55
Internet access	51	45	58	52
Hi-speed internet access	28	24	37	35
Mobile device for internet access	23	16	28	24
JPRS-navigator	12	7	23	19
Dishwashing machine	9	5	42	28
Air cleaner/moisturizer/foaniser	15	7	36	25
Air conditioning	15	12	35	33

* New user-innovators - who did innovations less than 5 years ago.

Questions:

“Technical equipment”. What items from the list do you have in your family?

“Demand”. What does your family have from the items mentioned above? What would you like to get/ renew if you had enough money for the purchase?

Perception of innovative products

In order to investigate further dimensions which characterize user-innovators the survey questions included a section on the perception of innovative products. What is the need for user-innovators to cope with modern technical equipment and new products in general?

According to the findings, in general people use modern equipment in order “to keep up with life” (43%). This option is shared both by user-innovators and across the population of respondents. The second leading rationale to use modern equipment shows that user-innovator habits relate more to work-oriented practices than average users (19% compared to 12%). User-innovators also reported to adore modern equipment more than the others (18% compared to 9%). We conclude that user-innovators perceive innovative products in more enthusiastic way, although we might have expected that there would be sharper difference in that respect.

User-innovators seem to have more skeptical perception of innovative products than average users: 21% of user-innovators consider that advantages of innovative products are over-estimated (as compared to 16% in average) and 14% of users think that consumption of innovative products and services can be dangerous compared to 8% in average. This lets us to suggest that their approach towards novelties is based on critical assessment, in other words we can assume that user-innovators have high expectations to products and their approval of products is rather based on their needs than systematic adoration innovations. This conclusion is underpinned by analysis of the answers to the question about the importance of association of the product with the latest technical trends. The results reveal that at the decision to buy a new product is correlated with this knowledge only in minor respect.

Table 7. Perception of innovative products by user-innovators (share of respondents, %)

	All respondents	User-innovators	
		All	who did innov. >5 years ago
N (Number of respondents)	1600	125	73
Which of the following statements reflects the best your perception of technical novelties? (Only one answer is possible)			
I adore technical novelties and try to use them every time	9	14	18
Modern equipment has to be used to keep up with life	41	42	43
I use some of technical novelties because it is necessary at work	12	16	19
My children encourage our family to use technical novelties	12	12	12
I barely encounter modern equipment in daily life	12	6	3
Modern equipment frightens me	5	3	1
None of it	4	5	5
Have difficulty to respond	6	3	0
With which of these statements would you agree the most (multiple answers are possible)?			
Innovative products often make our daily life easier	17	18	21
Advantages of innovative products are often over-estimated	16	21	20
Consumption of innovative products and services is often dangerous for consumers	8	14	12

	All respondents	User-innovators	
		All	who did innov. >5 years ago
N (Number of respondents)	1600	125	73
Innovative products consist largely of technical novelties	27	26	25
Innovative products are closely related to fashion	13	14	14
How appealing do you find innovative household appliance and electronics? (Only one answer is possible)			
Very appealing	17	23	30
Appealing	53	50	53
Not very appealing	14	15	13
Totally not appealing	6	4	2
Have difficulty to respond	11	8	3
How do you usually proceed when you wish to buy a technical novelty or a product with new features which costs a high price? (only one answer is possible)			
Try to buy the novelty straight away	7	7	9
Prefer to wait until the product gets cheaper	52	52	60
Refuse to buy	28	33	25
Have difficulty to respond	13	8	6
When you choose a product the most important for you is to check that it is the latest technical achievement or electronics (Only one answer is possible)			
Fully agree	4	10	12
Rather agree	21	26	25
Rather disagree	42	35	41
Totally disagree	29	28	21
Have difficulty to respond	4	2	2
Do you buy new technical equipment or electronics only if the old one goes wrong? (Only one answer is possible)			
Fully agree	23	24	20
Rather agree	43	35	39
Rather disagree	25	34	39
Totally disagree	6	7	3
Have difficulty to respond	3	-	-
Do you always or at almost always have to adjust your technical equipment according to your needs and taste if such a possibility is provided? (Only one answer is possible)			
Fully agree	8	12	13
Rather agree	39	48	58
Rather disagree	24	20	17
Totally disagree	18	16	8
Have difficulty to respond	10	4	4

User-innovators are more inclined to get the product they were aiming at even if its initial price is high. The results from the survey show that a slightly bigger share of user-innovators (9% as compared to 7% in average) would try to buy novelty straight ahead and try to buy the product when it gets cheaper (60% as compared to 52%). User-innovators who did innovation less than five years ago are less inclined to refuse to buy a product they wanted because of its high price (25% against 28%). Yet, it is interesting to note that it is not valid for users who did an innovation more than five years ago as 33% of the latter would refuse to buy a new product if it is too expensive.

It can also be noted that a significant share of user-innovators buys new equipment independently from the state of the already existing one. 39% of user-innovators who innovated less than five years ago (compared to 25% in average) reported that they disagree with the statement according to which the purchase of a new item is motivated primarily by the fact that the ancient one went wrong. This is an indirect indication that this type of users is more inclined to shape their needs-oriented consumer strategies according to higher level of requirements.

Furthermore, almost $\frac{3}{4}$ of user-innovators reported to adjust their technical equipment according to their needs and taste if such possibility is provided. Remarkably, almost a half of users is generally involved into such kind of activities. These figures confirm the potential of active user engagement into product innovation process. This is not to be ignored by companies who can facilitate this process by providing product design or infrastructure facilities which can enable users to adjust the products according to their needs and taste.

Channels of information diffusion

As mentioned above, our research is designed to investigate the profile of user-innovators and conditions which define their active engagement into innovation process. So far we did not search on the potential of user-innovation diffusion but we investigate how users get relevant information on their personal technical equipment. In order to tackle the issue of changing socio-technical conditions, we questioned our respondents about access to Internet, importance of collective discussion practices and some traditional marketing techniques.

According to our results, before buying a product, user-innovators consult a broader number of sources as compared to the rest of the respondents (table 8). User-innovators are more closely monitoring the new technology market. Almost a half of them are looking at the emergence of novelties (46% as compared to 27% in average). They also tend to consult other users' review and comments available on Internet (35% amongst "new user-innovators" as compared to 23%) and to get the information required from the media. Innovative users reported to pay more attention to advertising: 7% of "new user-innovators" try to acquire new products under the influence of advertisement and 31% of them take it into account when making their decisions. Yet, the majority of users, both innovative and non-innovative are likely to ignore advertising (62% of the sample and 55% of user-innovators). In order to double-check the importance of information diffusion between users, we asked an additional question about consultation of user reviews. 57% of "new user-innovators" reported to consult user reviews on a particular product model before buying it. This finding emphasizes again the importance of informal sources of information for users who are likely to adjust their personal equipment according to their individualized needs.

Table 8. Channels of information diffusion

	All respondents	User-innovators	
		All	who did innovations less than years ago
N (Number of respondents)	1600	125	73
Do you continuously watch what are the technical novelties on the market and collect information about them?			
Fully agree	4	8	11
Rather agree	23	32	35
Rather disagree	41	34	32
Totally disagree	29	24	19
Have difficulty to respond	3	2	3
Where do you get the most reliable information before acquiring new household appliance and electronics?			
Read application instructions	32	31	31
Read user reviews on the Internet	23	30	35
Consult my relatives and friends	50	48	49
Consult the seller	54	47	45
Newspapers, journals, TV programs, radio.	7	9	12
Do not need such information	5	4	2
Have difficulty to respond	4	2	0
Before buying a new household appliance or electronics, do you always or almost always read user reviews on this model in the Internet?			
Fully agree	7	15	18
Rather agree	28	35	39
Rather disagree	30	20	20
Totally disagree	32	28	21
Have difficulty to respond	4	2	1
What is your attitude to advertisement of household appliance and electronics?			
I try to buy advertised products	4	5	7
I follow information from advertisement when I make my choice of products	19	27	31
I do not pay attention to this type of advertisement	44	43	42
I try not to buy advertised goods	18	16	13
Have difficulty to respond	15	9	7

Discussion of results

Our study of user innovation in Russia has yielded several important findings which can contribute to further theoretical research on user innovation and improvement of quantitative measuring tools for the studied phenomena.

User innovation incidence

First of all, we found that user innovation in Russia has a high level of incidence amongst general consumer population. 7,8% of users can be considered as user-innovators which is consistent with other empirical studies (cf. table 9). Yet, it has to be noted that prior to the correction of the first findings via screening and recoding of the follow-up survey, this share was

significantly higher¹⁰. We also need to acknowledge that formulation of the question¹¹ may have led to somewhat limited interpretation of user innovation as it could have been reduced to appliances and gadgets. To increase the validity of results the next round of surveys would have to include open-ended questions or in-depth studies targeted at elimination of cases when user innovations were in fact limited to user upgrades.

Table 9: Share of consumer innovators among US (n=1,992), Japan (n=2,000), and UK (n=1,173) age 18+

	Russia		US	Japan	UK
	More than five years ago	Less than five years ago			
Consumer creator		1,1%	2,9%	1,7%	2,1%
Consumer modifier		3,4%	2,8%	2,5%	4,5%
Both	3,3%	-	0,5%	0,5%	0,5%
Total	7,8%		5,2%	3,7%	6,1%

Source: Based on [Ogawa, Pogatner, 2011].

User Innovation as Compensation of the Price Factor

Regarding motivation for product modification and product creation, Russian end-consumers reported are more driven by the price factor than by product absence on the market. According to our findings the number of users who engaged into innovation activity because the existing product on the market was too expensive was twice bigger than the number of users who engaged into innovation activities because the products were not sold in shops. Hence, a bigger share of user innovation products consisted of product improvement and not product creation from scratch. The first pilot survey conducted in the UK and Japan also showed that product modification activities are dominating over the creation of new products. Only in the US product creation is slightly more important than product modification. These findings do not confirm the common assumption that user innovations as a rule lead to functional improvement of a product [de Jong, von Hippel, 2010].

Given the high share of incremental innovation found in the sample studied and the rationale which triggered a different degree of user engagement into innovation activities (too

¹⁰ The application of strict criteria mentioned above led to exclusion of 7% of reported innovations in case of product creations and 31% in case of product modifications. Overall, before launching the follow-up survey, it was found that 28% of all respondents were estimated to be user innovators (modifier and/or creator).

¹¹ The formulation was the following: «Have you ever created new devices, technical equipment for personal consumption (for you, your family and friends) or to improve something amongst technical devices you have?»

expensive products), our hypothesis is that users tried to compensate price determination in a local market by enlarging the supply side.

This finding makes allusion to the conclusion about the nature of innovation and its relationship to commercial success of a product [Hienerth, Potz, von Hippel, 2007]. In the cited study of kayak industry it was confirmed that radical user innovation resulted into emergence of a new industry (hence, a new market), while incremental user innovations which were generated once the industry had been already established “were needed for the success of the commercialization process, the enlargement of the market”. In certain respect our findings across various geographic settlements which presumably differ at the level of market saturation, underpin this conclusion.

User Innovation as Compensation of Market Failures

User innovation activity differs substantially across different types of settlements (cf. table 10). According to the table, the important share of innovations can be found in the middle cities and villages. Moreover, in these settlements user-innovators were significantly more numerous to create new products than in other settlements and there was also a bigger share of responses which confirmed that the products required did not exist in local shops. The factor of price compensation also had a significant impact on innovation activity (cf. table 11). So far the study of dynamics of user engagement into innovation activities in middle cities and villages shows that it is in fact dependent on the market offer. We suggest the term of market saturation despite its different connotations to define market properties regarding the diversity of products sold out locally. The importance of market differentiation (or market saturation) can be underpinned by the following official evidence reported from the Ministry of trade in 2011 which shows that development of trade in Russia is uneven across the country. For instance, Moscow and Saint-Petersburg concentrate 46% of sales areas of the country and the other city with population above million of people concentrate 30% from the remaining sales areas. It means that 75% of population can access only to 24% of sales area [Minpromtorg Rossii, 2011]. According to the official data about 5% of Russian population does not have access to sales areas in their settlements. Access to sales areas is especially difficult in remoted areas in Russia where sales areas often just do not exist. Moreover, multiple regions do not seem to be attractive as sales spots since they are characterized by massive outflows of younger population.

Table 10. Incidence of User Innovation Engagement across Settlements

	User-innovators					All respondents
	All	who did innovations ...				
		less than 5 years ago			more than 5 years ago	
		All	Created new products	Improved existing products		
Moscow	8	5	0	7	11	7
Large cities	20	19	15	20	22	21
Middle cities	27	30	37	28	23	20
Small towns	20	19	6	24	22	26
Villages	24	26	42	21	22	26

Table 11. Motivation of user engagement across settlements

	User-innovators				All respondents
	All	who did innovations less than 5 years ago because the products required...			
		All	are not sold out in shops	are too expensive	
Moscow	8	5	4	7	7
Large cities	20	19	0	31	21
Middle cities	27	30	36	24	20
Small cities	20	19	28	10	26
Villages	24	27	32	28	26

So far our findings could reveal the importance of market saturation as a research dimension on user innovation. Further interpretation of these results has to be underpinned by more rigorous study of local market properties. The current dataset does not enable us to conduct a quantitative study of the relationship between the types of user innovation engagement and the level of market development across the country. However we suggest that this line of research has an important value for further studies of user innovation in transition and developing economies. Understanding of these variables can facilitate potential collaboration between users and companies and increase the efficiency of public encouragement of user engagement.

In next paragraphs we provide some further evidence to support the importance of further research on market characteristics.

User innovation and innovativeness of household

To pursue our analysis on different variables which determine user innovation engagement we tested the hypothesis about the influence of innovativeness on user innovation incidence. Respondents were asked if they possess certain modern appliances. Based on their responses we calculated “innovativeness of a household” as average number of appliances from fourteen options provided. Innovativeness of user innovators is clearly higher (cf. Table 12). If we compare this indicator and demand for innovative products, the “gap” between the actual number of modern appliances (innovativeness indicator) and the number of items which the users would actually like to have is the biggerr for user-innovators. This factor is also more

significant for users whose motivation for user innovation was determined by the price factor of items required.

Table 12. Actual and desired level of innovativeness measured as the average number of appliances from 14 options provided

	All user-innovators	User-innovators who did innovations...		Motivation: the product required...	
		less than five years ago	more than five years ago	are not sold out in shops	are too expensive
Innovativeness of the household (actual)	4,5	4,9	4	5,2	4,7
Demand for innovative products (have or would like to acquire)	6,3	6,8	5,5	6,6	6,8
“Gap” as User Innovation Trigger	1,8	1,9	1,5	1,4	1,9

Given the size of the sample we cannot analyze the innovativeness and demand for innovative products amongst user-innovators across the types of settlements. Yet, it is interesting to compare this indicator and demand for innovative products. As shown in the Table 13, the “gap” between the actual number of modern appliances (innovativeness indicator) and the number of items which the users would actually like to have is the biggest in large and middle cities. Thus, according to our results described above, the innovation incidence in middle cities is the highest. If the “gap” between innovativeness and demand for innovative products is not the main factor, it may still be interesting to proceed to further research on this dimension.

Table 13. Actual and desired level of innovativeness measured as average number of appliances from 14 options provided

	Total	Moscow	Large cities	Middle cities	Small cities	Villages
Innovativeness of the household (actual)	4,4	5,6	4,8	4,8	4,0	3,7
Demand for innovative products (have or would like to acquire)	6,3	7,4	7,2	6,8	5,8	5,3
“Gap” as User Innovation Trigger	1,9	1,8	2,4	2	1,8	1,7

So far it is possible to assert that user innovation provides an indication of unsatisfied demand and inadequate supply. Hence, data on user innovation is important for designing demand-driven strategies at company level, but also on a more global scale (industry, regional level, etc.).

Concluding remarks and suggestions for future research

The findings of the first empirical study of user innovation in Russia show that user innovation phenomena can add significant value to producer-driven innovation. Our results show that 1,1% of respondents created new devices in Russia in the last 5 years while 3,4% of

respondents were engaged into product modification activities. 3,3% respondents reported to be involved into innovation activity more than 5 years ago. In total we defined the share of user-innovators as the sum of these three groups, so 7,8% of Russian population are considered as user-innovators. These findings are comparable with the empirical studies carried out at the country level in the UK, Japan and USA. However, in order to make consistent comparisons across-countries, it is necessary to adopt the same methodology. In this respect, further research on user innovation in Russia needs to include an important stage of sample cleaning in terms of originality items claimed as innovations. It would also be necessary to specify the definition of innovation as in ours study it was limited to technical novelties.

However, despite these shortcomings, our study is the first one to address a number of new dimensions on user innovation which are relevant to study user rationale to engage into innovation activities, and in particular, in case of transition economies. The previous studies and namely, Eric von Hippel's explanation, state that user innovation cost more than standardized goods from manufacturers. According to these studies, users engage into innovation activities because their results appeal more to diversified needs. Yet, this approach does not consider price motivation which may trigger end-consumer to develop their own goods. In fact, according to our survey findings, a big share of innovative users in Russia engaged into innovation activity in order to develop a less expensive good than the one which was available on the market. In this case, one may expect both product and process innovation which would not necessarily lead to a new market generation as stated by von Hippel. This trend is a significant indicator for user-led strategic in companies and demand-oriented innovation policy. It also means that producer innovation is no longer the only way to cover production expenditures and the costs of innovation. We suggest that further studies need to focus on user-innovators expenditures in order to explore this dimension. The methodological problem which has to be addressed next is to understand the types of innovations which result from user innovation motivated by the price factor. In fact, it is likely that all factors being equal, searching for cheaper solution may trigger a process innovation which enables to spend less in order to produce the same product. However, some qualitative improvement of the product may also take place, even if initial motivation consisted in the fact that products available at the market were suitable for consumer needs but too expensive. In-depth surveys or interviews are needed to assess the resulting user innovation and understand better its economic value and the nature of spillovers for the rest of the economy.

Our study also revealed that user innovation engagement differs across the type of settlement. The biggest incidence of user innovation in Russia was found in middle cities and villages. Taking into consideration the impact of price factor, we can assume that in case of Russian end-consumers engagement into innovation activities does not seem to contribute to

open new markets but rather to alleviate the disproportions of the existing one. Given that users are disadvantaged compared to producers in terms of solution information (von Hippel, 1994), why would they be able to replicate an existing product paying less for it? Our hypothesis is that to answer this question, it is necessary to analyze various properties of local markets. We suppose the notion of market saturation is relevant for further research on issues described above, namely on the analysis of substantial differentiation of user innovation patterns across different types of settlements in Russia

In Russia and other countries with high level of income inequalities it is also necessary to consider the differences of incomes. As our sample is too small we cannot assess the impact of socio-economic status of population at the frequency of innovation at the current stage of research.

Finally, we suggest to incorporate in future surveys additional dimension on user networking behavior and user innovation diffusion.

Overall, exploring additional dimensions on user innovators may contribute to their better identification and hence, increase the efficiency of demand-oriented and user-oriented innovation policy. Empirical evidence on user innovation in Russia suggests that there is a strong potential for stimulation of more active collaboration with users.

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Dirk Meissner

Russia, Moscow, Myasnitskaya str. 20, 101000

National Research University – Higher School of Economics (HSE)

Deputy Head

International Laboratory for Science and Technology Studies

E-mail: dmeissner@hse.ru

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