DEVELOPMENT OF A BUSINESS MODEL FOR SOCIAL WEB OF SERVICES

Mikhail M. KOMAROV
Associate Professor, Department of Innovations and Business in IT, School of Business Informatics, Faculty of Business and Management, National Research University Higher School of Economics
Address: 20, Myasnitskaya str., Moscow, 101000, Russian Federation
E-mail: mkomarov@hse.ru

Anna D. KHOKHLOVA
MSc Program Student, School of Business Informatics, Faculty of Business and Management, National Research University Higher School of Economics
Address: 20, Myasnitskaya str., Moscow, 101000, Russian Federation
E-mail: khokhlova.a.d@gmail.com

The object of this research paper is the way to organize an e-business based on the concept of smart things. In order to achieve the objective of this work - the development of a business model for Social Web of Services - several tasks were set and accomplished: existing concepts of the Internet of Things, the Internet of Service and the Web of Service were described, defined and redefined, making clear the differences and similarities between them. After this, the vision of the Social Web of Service concept is provided and several business models of service providers are reviewed based on the mentioned concept. The business models are presented in graphical view according to the business models representation methodology by Alexander Osterwalder. There is also a presentation of a new business model for a Social Web of Service company. Tis model was developed according to the analysis of existing companies, their strength points and ways of monetization, and main trends in this sphere. Moreover, some limitations of this model along with possible future development areas for it are provided. The offered paper may be considered as a novelty due to the new approach presented in it, identifying the Social Web of Service and the business model developed for companies working according to the for Social Web of Service concept, considering also companies working in areas close to Social Web of Service.

Key words: Internet of things, Internet of services, Social Web of Services.

Citation: Komarov M.M., Khokhlova A.D. (2015) Development of a business model for Social Web of Services. *Business Informatic*s, no. 2 (32), pp. 20–29.

Introduction

Over the last decade, the Internet has changed drastically: nowadays it is impossible to imagine our life without it. People feel lost without a smartphone or a tablet next to them, even small kids use it widely and easily, for both entertainment and educational purposes. There are many predictions about possible ways of further development of the Internet, as well as about the ways it can influence people.

The changes described in this article occurred in 2008–2009, when the number of Internet connected things exceeded the number of people on the Earth. According to Cisco Internet Business Solutions Group [1] that was the «birth» of the Internet of Things (IoT), even though the IoT concept first appeared in 1999, thanks to the work at the Auto-ID Center in Massachusetts Institute of Technology (MIT). Along with the Internet of Things, researchers are talking about the Internet of Services and the Web of Services. Even if these

terms look very similar, they have noticeable distinctions, though they enhance, overlap and supplement the original concept.

The main opportunity brought to people by the Internet of Things is a wide range of methods and means for humans to interact with the world. Besides being a new way to interact with electronic devices, it is also a new way to use any «things», beginning from your kettle or lamp to your car, refrigerator, your «smart home» etc. This IoT approach could turn over the very idea of living, the opportunities it offers could change our routine life, making it look like the most daring fantastic stories. Nowadays it is hard to imagine the whole picture of IoT usage, but there are no doubts that it will transform each area of human life.

As future changes are unavoidable, business wants to make money on this. That's why both famous and respected companies and new start-ups pay so much attention to the research and development of new «things», applications and services. Smart watches, smart bracelets, smart shoes, smart homes and other «smart» things are well-known and are in demand even now, and we don't know what kind of rush for such kind of technologies may arise in the future, when there will be 50 billion devices connected to the Internet in 6 years, according to Cisco's predictions [1].

Companies use different business models in order to monetize their services or sell their products, but the most common ones are multi-sided platforms, free approach, and bait & hook model.

This research will analyze the business models of several companies that provide services falling under the Web of Services approach, in order to discover some main trends in monetization and delivering the product to the client. The main trends will be analyzed and implemented in order to develop a business model for the Social Web of Things.

1. Internet of Things, Internet of Service and Web of Service concepts

Despite the apparent simplicity of the term «*Internet of Things*», it is rather difficult to give it a proper explanation. However, the main aim is obvious: the Internet of Things is created in order to facilitate the connection between the applications and services of the virtual world, on one side, and the physical world of things, on the other, for us to control and sense our environment in a better and more efficient way.

With the great rise of interest to the IoT, more and more researchers tend to give their own definition of this term. Casagras [2], SAP [3] and EPoSS [4] define this term in different ways, which can be considered as three different approaches, distinguished by Atzori and others [5] as «the semantic oriented vision, the Internet oriented vision and the Things oriented vision», correspondingly.

It is remarkable that each definition tries to give the most detailed and rather technical information, even touching the issues of security, standardization and particular technologies, which should enable the process of interchanging data. In our opinion, it is unjustified to some extent, because we are forced to reconsider and redefine the term due to the ongoing modification of technologies, approaches and standards. That is why we prefer the following definition, which is more common but still reflecting the essence of the concept: the Internet of Things is a term used to describe a situation when everyday objects are connected to the Internet and participating together using some services, while conventional connected devices converge with smart appliances.

The need of the services or, simply, applications, which would regulate the automatic interaction between smart things, is becoming the second biggest question. That is why the term «*Internet of Services*» was born. The phenomena of the IoS may concern different spheres [6], however, in this research we would like to focus on its connection with the IoT. The Internet of Services answers the question of how we communicate and engage with the Internet of Things. The IoT is stuffed with data: every device spews out petabytes every day. No question that all this flow of information must be understood and analyzed. The IoS suggests that every connected system has its own unique API, and the metadata collected from a group of systems has APIs. It will simplify the consumption of key information and events, the decision-making and management for all the services. The Internet of Services will replace the API platforms, so that a large amount of data produced by things can be shared with the data consumers, i.e. apps, people or other «things».

The term «*Web of Services*» makes an accent on the technical realization of the IoS. Such a web makes services accessible to and processable for machines, having a semantic architecture in common and following main web principles, such as decentralization, modularity, simplicity, addressability via URIs and being built for machines.

The main problem of the WoS today is that there is no clear definition of what constitutes a service at a concep-

tual level. Therefore, there is no unified way to describe a service semantically, though different approaches are developed (OWL-S, WSMO, WDSL-S). Thus, as long as there are many services available on the web, there is no opportunity to find them automatically, without human intervention.

If the unified way to describe a service is applied, a wide range of possible applications will be accessible, such as:

✦ Service discovery: a machine will be able to find a service to solve a problem automatically, without consulting a person;

✦ Contracting and execution: a machine could choose the best option among the available services in terms of execution and contracting details, for example, the service price or necessity frequency;

✦ Billing or revenue sharing: a machine could be able to make a best deal with the service provider on such things as billing or revenue sharing for service usage;

✦ Experience-based failure replacement: if the chosen service falls short of the user's expectations, a machine would replace it with a better one. It can also rate the service, making other machines know the quality of the services used;

✦ Service detalization: a machine could be able to split a task into subtasks and find a service for each of them. These services may be carried out simultaneously, if it cuts the costs or is logically possible.

Having made the distinctions between terms IoT, IoS and WoS clear, we would like to focus on the Social Web of Services. There is no official definition of this term, as there is no example of a successfully operating social web of services. That is why we would like to explain what we mean exactly by the term SWoS.

As there is no formed Web of Services, which provides an opportunity to find and use available services automatically, yet, there might be an opportunity to share services or the experience of using them between people via a social network. That could be a transition period between the IoS and the WoS, while the researches are working on the semantic approach to service description or any other solution to the existing problem.

In order to suggest a possible business model for a Social Web of Services, we would like to explore the existing business models of service providers. In order to locate the area of research, we will focus on the services related to controlling smart things.

2. Existent business models overview

Today almost all major IT companies are developing smart things, so they offer applications to control them. As corporations' business models do not entirely depend on this kind of services, we prefer to explore several startups in more detail.

The first one to mention is *SmartThings*. This project was successfully funded on Kickstarter in 2012, having collected almost five times more than they had intended, i.e. $ 1.2 million. Today they offer a whole range of services. First and the most interesting for us is their mobile application, which helps to control all the user's smart devices. It is free to download and allow the remote control of smart devices in your home.

The Dashboard in the app lets the user see what is happening at their home, monitoring each device, configuring the instructions for them and discovering new ways of using them. On the Things screen, you can organize your smart things into groups based on your own classifications. There is also an opportunity to «communicate» with your smart home, which looks like you are sending a message to it. This is the way you can customize different actions to automatically happen, and receive notifications when something is actually happening.

As long as this application is free to download and use, the company also has its own SmartThings Shop, which offers a wide range of smart things: hubs, motion, presence and moisture sensors, power outlets, strobe alarms, lighting controls, different types of door locks, and even a relay fixture module and a shield for Arduino. It is fair to notice that the cost of such devices is around $50, which is quite affordable. The only exception are the door locks, which are far more expensive – around $200. Some of the available devices is produced by SmartThings itself, others are bought from external developers.

Another domain of services is SmartThings Solutions. The company provides different suites for common control scenarios, such as:

✧ Detect Leaks and Floods;

✧ Keep Valuables Safe and Items Secure;

✧ Automate Your Lights;

✧ Know Who's Home When You're Not;

✧ Turn Things On/Off When You Come & Go;

✧ Keep Tracks of Kids and Elders;

✧ Control Window ACs, Fans and More;

✧ Lock and Unlock Your Door.

These solutions include a suite of necessary sensors and a scenario of the application work. It is more prof-

itable to buy a canned solution than to get all sensors separately and generate a scenario by yourself. For example, a solution to detect leaks and floods includes two moisture sensors and costs $99. At the same time, a single sensor costs $54, so buying a package can save you almost $10 and many efforts.

The company regularly conducts promotion campaigns, providing discounts or special occasion kits. They also keep a blog where they share best practices from their clients and describe new possible ways to introduce their technologies into modern life.

As for customer support, they offer a quick guide to their app, a troubleshooting service, forming the SmartThings Labs and SmartThings community of makers and developers. The two last services are of the greatest interest to us. Labs gives an experimental early access to popular third-party devices and services that can work together with SmartThings. That let us suppose that they also make money on third parties' devices promotion and testing. As for developers, SmartThings provides an open API for those who want to integrate from an external system, and in order to support off-the-shelf devices, they already support Zigbee and A-Wave protocols. They also plan to support IP-connected devices and cloud-connected devices. The SmartThings mobile application includes an apps catalog of developed apps services, such as Apple Store and similar. The SmartApp programming language is a Domain Specific Language based on the Groovy programming language, the specifications of which are open, the company also provides a range of tutorials and examples for the developers.

All provided information and some of our personal assumptions let us define their business model. We will use the Osterwalder canvas, as it is the most illustrative, simple and understandable way to represent company's business model (*Fig. 1*).

Unfortunately, SmartThings devices are available in USA and Canada only, and are not easy to access worldwide, which limits the growth possibilities.

Another startup aiming to provide an opportunity to control smart devices i*s Revolv*. It was founded in 2012 as Mobiplug, graduated from TechStart incubator and received $2.7 million from Foundry Group (a venture capital firm), having their first sales started in 2013. They offer similar to SmartThings application to control

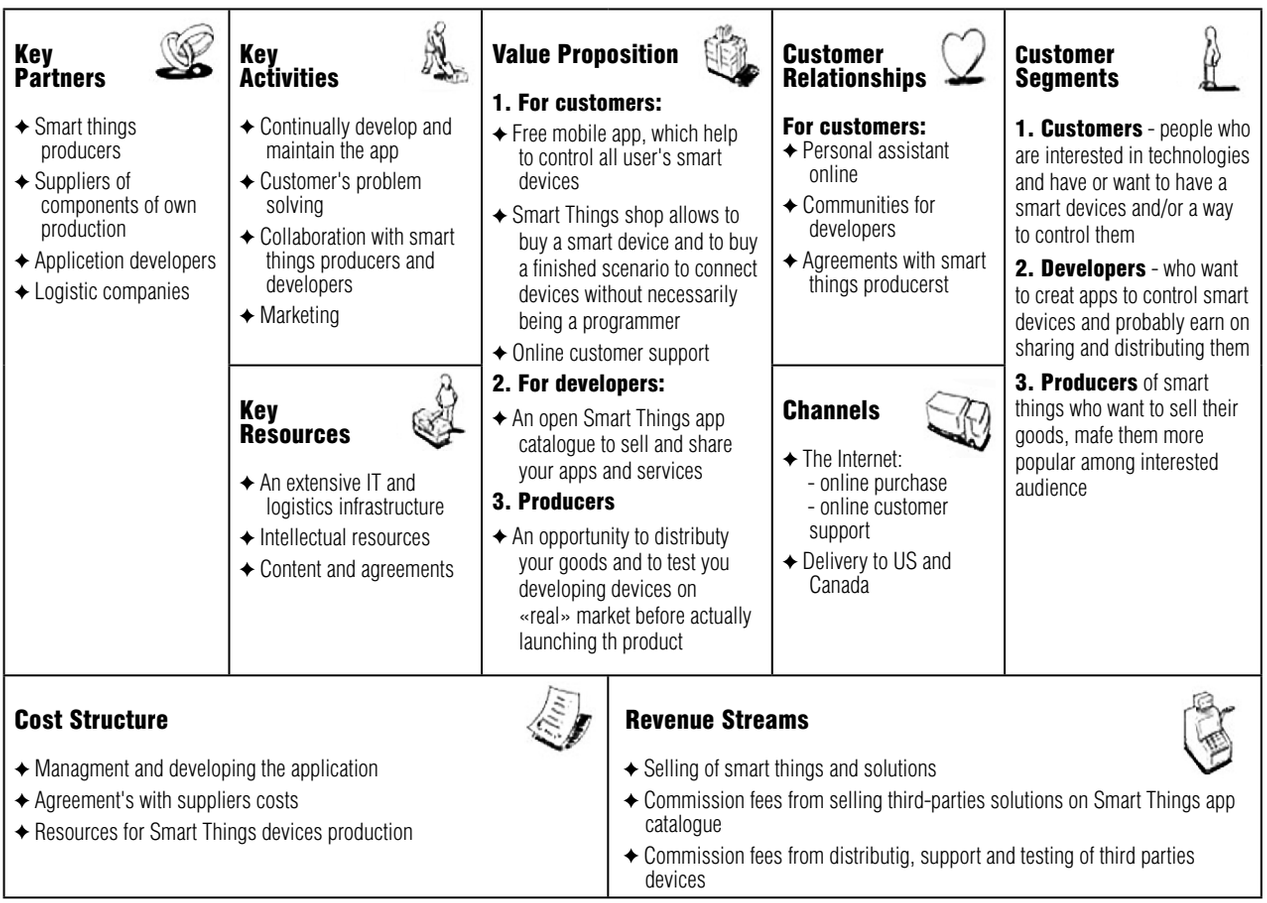

Fig. 1. Proposed SmartThings business model

devices, but there are several noticeable distinctions.

First of all, a user can simply create different scenarios by themselves, without downloading any additional applications. Moreover, Revolv utilizes the GeoSense technology, so the user can «control his/her house automatically based on their proximity to or from home, all with their phone never leaving a pocket».

Secondly, the range of supported devices is wider: at the moment of this research, they support Philips Hue lights, Yale and Kwilkset locks, Sonos Hi-Fi speakers, Belkin WeMo, Honeywell thermostats and Insteon sensors. It means that such things as audio or temperature control is available on Revolv but not on SmartThings, though, for example, only the latter provide a moisture sensor. There is no proof of their cooperation with smart devices manufacturers, so they probably provide accessibility of third-party devices on their own. Unlike SmartThings, the only thing produced by Revolv itself is Revolv Hub ($299), which is used to interconnect all the devices. All the smart things are supposed to be bought by the user themselves on Amazon.com (all links to the necessary products are provided).

Thirdly, probably because of the later launching, Revolv still does not have open API or developer's guide, though they are officially planning to make it available. Their blog and customer support are not as convenient and informative as that of SmartThings, but we suppose it's also due to the later market entry.

The most important Revolv technological difference is that it uses other radio standards: Insteon, WiFi and Z-Wave are available now, and Zigbee will be added this year. Afterward, they intend to ship 900 MHz, 415 MHz and 933 MHz. Remarkably, they guarantee lifetime subscription, which enables GeoSense automation and remote updates that allow Revolv's seamless integration with the products the user already owns for the lifetime of the product.

Unfortunately, today Revolv operates with iOS only, but they are planning to issue an Android version in Q2 2014. They also suggest that the users leave requests for devices to be supported and assure that they take these requests very seriously. Similarly to SmartThings, they don't ship or distribute their product to other countries except for United States, because to enter a country, they first have to complete the research and compliance processes, as well as comply with the protocol certification requirements for each country. As they have seven radios, this would be a rather lengthy and complicated process.

The business model for Revolv in the Osterwalder canvas could be the following (*Fig. 2*):

The problem of unified control of all smart devices ex-

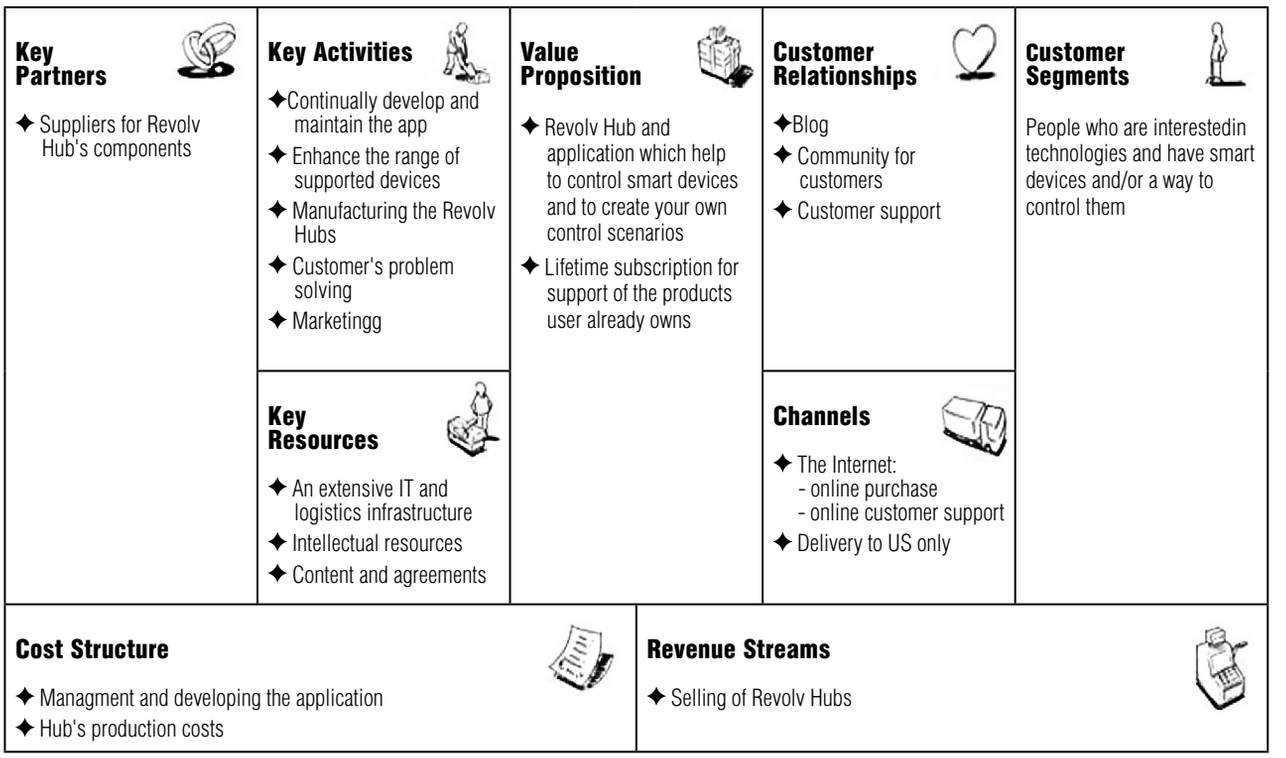

Fig. 2. Proposed Revolv business model

ercised the minds of such giants as Microsoft, Cisco and others, but their projects had little success.

Thus for today, the main limitation for new market players is the range of supported devices and their availability. In order to sweep the market, it is crucially important to work with the most popular and affordable smart devices. The greatest competition today is on the US market, where there are several competitors and the maximal share of iOS devices compared to other countries [7]. At the same time, in other countries, Samsung has more power, because the availability of its competitors' devices is limited, while Samsung products are readily available. However, there is still an opportunity to beat the electronic giant with the type of supported devices. While Samsung operates with its own appliances, which are rather massive and expensive, it is possible to enter the market with smaller, cheaper and simpler devices, like the sensors and power outlets offered by SmartThings and Revolv.

Samsung is a strong competitor, due to its brand strength, service level and resources for development, but the market of smart devices control application is still unsaturated, which leaves an enter opportunity for new players, both for the Russian market and for other countries.

There are also several providers of communication to any service via an encrypted P2P connection (Weaved) [8] or different services for developers (Microsoft HomeOS and others). However, the three described companies are the main pretenders for the unified method of controlling smart devices.

3. Business model of Social Web of Services

The first presentation of the idea of Social Web of Services belongs to the Russian startup called *Thinger*. It took place in 2013, when its creators took part in Microsoft Imagine Cup 2013. They presented a prototype of a web resource that gives a user centralized access to their smart devices and allows them to create their own interaction scenarios. Unfortunately, due to some financial problems, this service still hasn't entered the market, but the very idea of interaction between devices via their own network seems to be very promising.

Unlike SmartThings or Revolv, this type of service is not limited by home automation. The concept of Social Web of Services supposes that things will have an opportunity to «communicate» with each other according to specific scenarios, without human interaction. SmartThings and Revolv let the owner of things know when something is wrong, for example, if a flood happens or a door was opened unexpectedly, by sending them a notification. SWoS will do it another way: it will automatically contact a maintenance service, or inform the police about breaking in. The applying is similar to the Web of Service concept, but here the search of the necessary service is not automated, the instructions should be chosen by the user, i.e. the owner of smart things. One of the creators of Thinger gives the following example of its possible use: «When your car detects that you are almost out of gas, it changes the route in your navigation system so that it passes the nearest gas station.»

Our example of a possible business model for a company based on the SWoS concept is presented below.

The value proposition in this case is defined mostly by the functions supported by the system. Let's say that we suggest a platform and an application for your smartphone, which lets you control your smart devices. While the platform provides an opportunity to write different scenarios, the app is a «light» version of the platform, so you can just add or remove the scenarios you already have. A user has an account in the Social Web of Services and can connect their devices, each of which has its own profile. Technically, this SWoS can be an expansion of the existing social networks, such as Facebook or VKontakte, but we will consider it as a solitary web, so that we can fully focus on the service it provides. At the same time, there is a developing tool, which gives the user an opportunity to create their own scenarios of interaction between the devices. While the users' things has their own profiles, they also has specific types as «smartphone», «kettle», «door», «lock», «car», «refrigerator», etc. so the scenarios are written not for particular things, but for the specific type of things. This allows users and developers to create common scenarios and share/sell them on the SWoS Store.

This brings us to the next segment of our customers: the developers. These people may be common users, but they also are programmers. It is important to notice that, although the SWoS offers an opportunity to create scenarios with a simple intuitive interface, so that even a non-programmer can use this option, it is limited to basic functions and can include not more than X things (the exact number of the things supported is not important, we only need such a limitation to save an opportunity to sell «complex» scenarios, avoiding frightening users away with the lack of available scenarios). Nevertheless, knowing JavaScript or any other programming language supported by the SWoS, developers can create more complex, high-level scenarios, which can involve more things and services.

Besides ordinary users and developers, there are two other customer segments: things and service providers. As a usual social network contains groups and official pages, our SWoS contains Service and Provider pages. In order to create such a page, a service provider or a device supplier should pay to the company, though in the start-up period this access could be granted for free to fill the platform. A Service Page (SP) is a so-called e-shop of services. This means that, for example, a gas station in the example above creates a page, which reflects the services provided. They specify the type of gas they sell, its price, their location and other necessary information. They also may create their own scenario, which enables cars to automatically book a place in the queue, to add their location to the route or anything else if they are going to fill in the car. A user can buy their scenario (service) on the SWoS Store and enhance it with some limitations, for example, the price level or the distance so that this service would not work if the price is higher than they want or they are farther than several kilometers. SPs also aggregates service feedbacks, collects customers' comments, calculates the rate of the service and can have a usage counter.

Things producers' pages are similar to SPs, but they also have an opportunity to sell things or share the access to them. It might be difficult to imagine how the remote access to a kettle, which might be situated abroad, could be useful, but here is an example. Imagine that you don't have smart TV, but you want to record some particular TV program. Therefore, you can use the remote smart TV from the producer in order to get the record. Alternatively, you want to try a new X-box game, but you don't have the console. Getting the remote access to somebody's X-box, you can play this game on your own smart TV.

Sharing things is also one of the main features of the SWoS concept. You can provide several levels of access to your smart devices to your friends. For example, when you don't need some of your devices, your friend can use them, or you can share the access to your alarm clock with your colleague so that they could choose a ringtone and time for it. The main distinction of such friendly sharing from the Producer Page (PP) is that such sharing is free, while producers can sell the access.

SWoS is a multi-sided platform and doesn't have any other channels but the Internet. It provides free access to the platform and a free mobile app, but it makes money on its cooperation with service providers and suppliers. The creation of such pages is chargeable, and it also takes a small commission fee on the paid sharing of devices. Its SWoS Store also returns good interest from each purchase. Moreover, the impersonal statistical information about the smart things usage is sold to third parties. SWoS can also sell target advertising places, which provide additional income.

The key resources of SWoS are intellectual resources, such as the users' personal information, databases, development tools and other know-hows and IT technologies. The key activities of a SWoS- based company should include the support of the platform and applications, as well as constant work with service providers and things producers, i.e. verifying them and controlling their activity in order to protect the users from illegal content and other violations.

The cost structure mainly includes the expenses on the platform and apps support, along with employees' salaries and agreements with suppliers' costs. The latter arise when the SWoS begins to support third-party devices, which do not have open APIs, so that it is necessary to make an agreement with the smart thing's producer, in order to include their devices in our supported devices list.

The business model of SWoS in terms of the Osterwalder canvas looks like this (*Fig. 3*):

Conclusions

Thus, the developed business model of Social Web of Services combines the idea of common social web and usual service selling, increasing the quantity of revenue streams and enhancing the usual ways of controlling smart devices. It may be the transition way to the full Web of Services, and it can increase human's way of living by creating a «smarter world».

This concept also has several predictable problems concerning its protectability, privacy and legitimacy. We are sure that the question of system's hacking resistance should be the first issue to solve before launching the platform. It is important to convince people that their private information will not be transmitted to other parties, and no one will have access to their devices without their permission. It is important to have an army of your own employees, whose only responsibility would be to monitor the system's security. There also may be some technical way on the user's side to protect themselves from the attack, for example, there might be additional updatable passwords or additional profile connections to the user's data, in order to restrict access from suspicious locations etc.

Another possible problem that could concern the SPs and PPs is illegal content or fake providers. This should be resolved with legal agreements with providers when

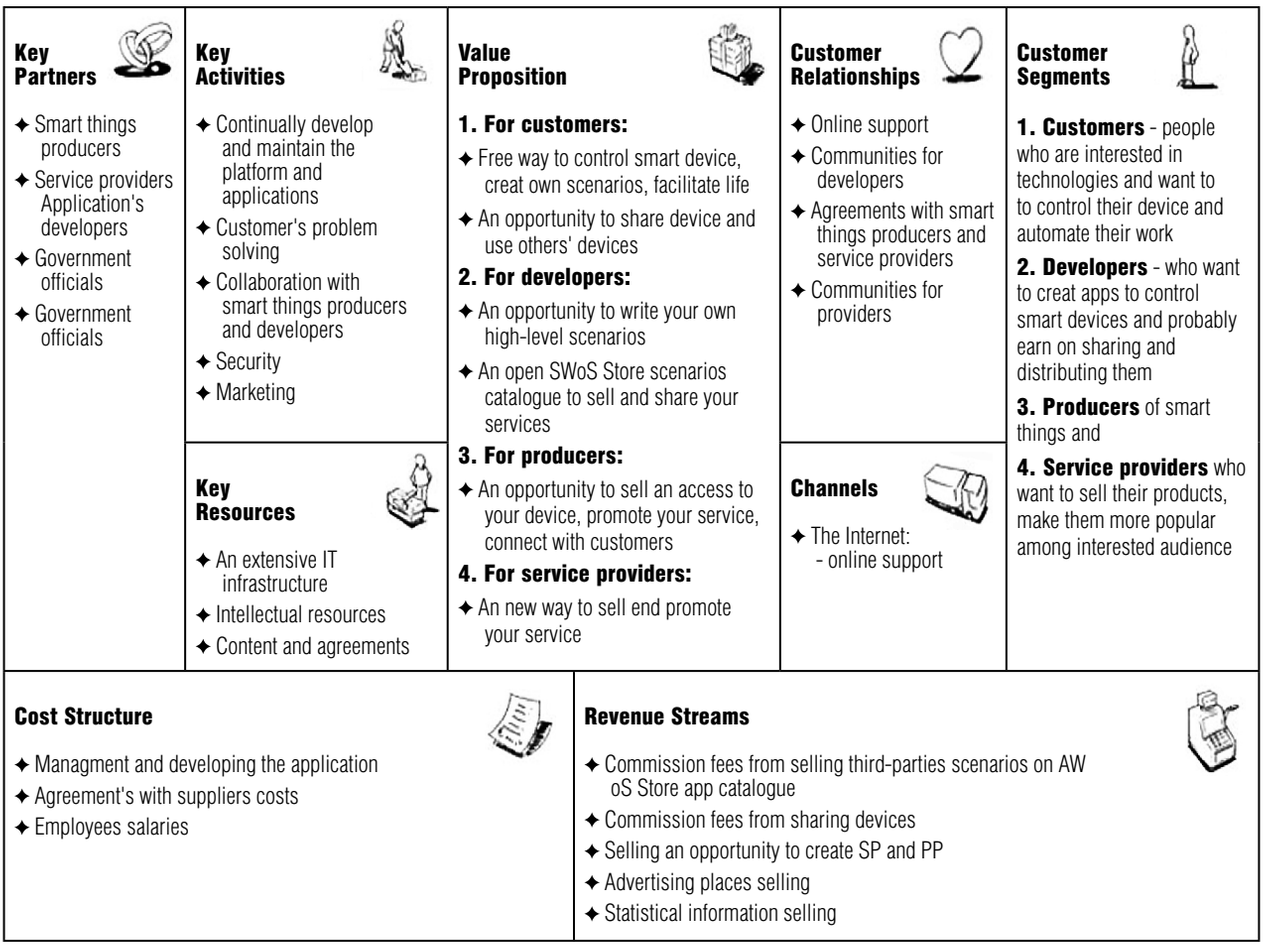

Fig. 3. Proposed Social Web of Services business model

creating the page, as well as special monitoring of their activity, so that you can share your risks.

The ownership of such kind of service could also constitute a problem. That is why we recommend the ownership be shared not only with private companies, but also with government officials, and perhaps, while the service is international, its localizations in different countries should be separated, in order to protect users from different restrictions of the local government.

In conclusion, we would like to say that we believe that such kind of service can be implemented in our lives in the nearest future, as soon as smart devices become more accessible and service providers, more digitalized, so it can mark the beginning of the next Internet revolution. ■

References

1. Evans D. (2011) *The Internet of things. How the next evolution of the Internet is changing everything*. Cisco Internet Business Solutions Group. Available at: https://www.cisco.com/web/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf (accessed 20 June 2014).
2. *Casagras IOT Definition*. Casagras. Available at: http://cordis.europa.eu/news/rcn/30283_en.html (accessed 20 June 2014).
3. *SAP IOT Definition*. SAP Research. Available at: http://services.future-internet.eu/images/1/16/A4_Things_Haller.pdf (accessed 20 June 2014).
4. *ETP EPOSS IOT Definition*. ETP EPOSS. Available at:http://old.smart-systems-integration.org/internet-of-things/Internet-of-Things_in_2020_EC-EPoSS_Workshop_Report_2008_v3.pdf/download (accessed 20 June 2014).
5. Atzori L., Iera A., Morabito G. (2010) The Internet of things: A survey. *Computer Networks*, no. 54 (15), pp. 2787–2805.

6. *SEEKDA*. Available at: http://www.slideshare.net/dipina/towards-future-internet-web-30-internet-of-services-internet-of-things# (accessed 20 June 2014).
7. *ComScore research*, February 2014. Available at: http://www.comscore.com/Insights/Press_Releases/2014/4/comScore_Reports_February_2014_US_Smartphone_Subscriber_Market_Share (accessed 20 June 2014).
8. *Weaved Overview*. Available at: http://www.yoics.com/overview (accessed 20 June 2014).
9. Osterwalder A., Pigneur Y. (2010) *Business model generation. A handbook for visionaries, game changers, and challengers.* Hoboken: John Wiley & Sons.

РАЗРАБОТКА БИЗНЕС-МОДЕЛИ ДЛЯ СОЦИАЛЬНОГО ВЕБА СЕРВИСОВ

М.М. КОМАРОВ
кандидат технических наук, доцент кафедры инноваций и бизнеса в сфере информационных технологий, школа бизнес-информатики, факультет бизнеса и менеджмента, Национальный исследовательский университет «Высшая школа экономики»
Адрес: 101000, г. Москва, ул. Мясницкая, д. 20
E-mail: mkomarov@hse.ru

А.Д. ХОХЛОВА
студент магистратуры, школа бизнес-информатики, факультет бизнеса и менеджмента, Национальный исследовательский университет «Высшая школа экономики»
Адрес: 101000, г. Москва, ул. Мясницкая, д. 20
E-mail: khokhlova.a.d@gmail.com

Предметом исследования в данной работе является способ организации электронного бизнеса, базирующегося на концепции умных вещей. Для реализации цели работы – разработки бизнес-модели социальной сети вещей – были поставлены и решены следующие задачи: описаны существующие концепции Интернета вещей, Интернета сервисов и веба сервисов, даны уточнения определений каждого из понятий, приведены основные характеристики и выявлены различия между данными концепциями. В работе приводится видение концепции социального веба сервисов, а также проводится обзор и анализ компаний и бизнес-моделей процессов предоставления услуг данными компаниями на основе сформулированного видения социального веба сервисов. Бизнес-модели каждой из рассматриваемых компаний представлены в графическом виде на основе методологии представления бизнес-моделей Александра Остервальдера. В работе предлагается собственная бизнес-модель для компании, работающей в рамках концепции социального веба сервисов, разработанная с учетом проведенного анализа существующих на рынке компаний и их сильнейших сторон и способов монетизации, а также основных перспективных направлений развития в данной сфере. Также предлагается ряд условий и ограничений применения предлагаемой модели, наряду с возможностями для дальнейшего развития данной концепции. Новизна предлагаемой работы заключается в определении социального веба сервисов и разработке бизнес-модели для компаний, работающих в рамках социального веба сервисов, с учетом анализа существующих бизнес-моделей компаний, ведущих свою деятельность в смежных и близких к социальному вебу сервисов областях.

Ключевые слова: Интернет вещей, Интернет сервисов, социальный веб сервисов.

Цитирование: Komarov M.M., Khokhlova A.D. Development of a business model for Social Web of Services // Business Informatics. 2015. No. 2 (32). P. 20–29.

Литература

1. Evans D. The Internet of things. How the next evolution of the Internet is changing everything. Cisco Internet Business Solutions Group, 2011. [Электронный ресурс]: https://www.cisco.com/web/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf (дата обращения 20.06.2014).
2. Casagras IOT Definition. Casagras. [Электронный ресурс]: http://cordis.europa.eu/news/rcn/30283_en.html (дата обращения 20.06.2014).
3. SAP IOT Definition. SAP Research. [Электронный ресурс]: http://services.future-internet.eu/images/1/16/A4_Things_Haller.pdf (дата обращения 20.06.2014).
4. ETP EPOSS IOT Definition. ETP EPOSS. [Электронный ресурс]: http://old.smart-systems-integration.org/internet-of-things/Internet-of-Things_in_2020_EC-EPoSS_Workshop_Report_2008_v3.pdf/download (дата обращения 20.06.2014).
5. Atzori L., Iera A., Morabito G. The Internet of things: A survey. Computer Networks. 2010. No. 54 (15). P. 2787–2805.
6. SEEKDA. [Электронный ресурс]: http://www.slideshare.net/dipina/towards-future-internet-web-30-internet-of-services-internet-of-things# (дата обращения 20.06.2014).
7. ComScore research, February 2014. [Электронный ресурс]: http://www.comscore.com/Insights/Press_Releases/2014/4/comScore_Reports_February_2014_US_Smartphone_Subscriber_Market_Share (дата обращения 20.06.2014).
8. Weaved Overview. [Электронный ресурс]: http://www.yoics.com/overview (дата обращения 20.06.2014).
9. Osterwalder A., Pigneur Y. Business model generation. A handbook for visionaries, game changers, and challengers. Hoboken: John Wiley & Sons, 2010.