OVERCOMING TECHNOLOGY RISK IN DEVELOPMENT OF SaaS SOLUTIONS MARKETS

Nedzad FAJIC[1], Ovidiu BLAJINA[2], Marian GHEORGHE[3]

SaaS adoption can bring out several promising benefits, despite the fact that some corporate organizations are still reluctant to introduce SaaS solutions mainly due to trust concerns. In this competitive world, the first step to success is to influence the behavior of the customer. Technology risk perception is still preventing en large customers to accept the SaaS-hosted applications for their information technology needs and requirements. The paper is focused on establishing a framework for improving customer reluctance to SaaS, based on prescriptive decision-making theory.

Keywords: SaaS, consumer behavior, decision theory, technology risk.

1. Introduction

Software as a Service, SaaS, owing to its numerous benefits is being applied by most of the business sectors in the world.

Corporate customers specifically in the European region however, are still reluctant towards adapting SaaS solutions offered by cloud vendors due to the fear of taking risk or resistance towards changing and adapting newer technologies. European decision makers tend not to be early adopters of innovations in information technology (IT) (compared to e.g. U.S. American or Asian consumers) and thus not accepting fast new trends in this domain. Though marketers in influencing consumer purchase decisions had always used decision theories, none were utilized in the SaaS arena so far.

SaaS is found to be highly essential in the future [1]. For SaaS delivery worldwide software revenues were predicted to develop from 2008 to 2013 by 19.4 %, which is greater than 3 times vs. the CAGR (Compound Annual Growth Rate) of 5.2% of the total software market [2]. Particularly in those application markets where less customization levels are needed, practitioners view likely chances for successful adoption of on-demand software delivery models [3].

[1] PhD Candidate, Doctoral School on Engineering and Management of Technological Systems, University POLITEHNICA of Bucharest, Romania; GHX Europe, Healthcare SaaS, Cologne, Germany, nedzad.fajic@gmail.com
[2] Assoc. Professor, PhD, Faculty of Engineering and Management of Technological Systems, TCM Department, University POLITEHNICA of Bucharest, Romania, ovidiu_blajina@yahoo.com
[3] Professor, PhD, Doctoral School on Engineering and Management of Technological Systems, TCM Department, University POLITEHNICA of Bucharest, Romania, marian.gheorghe@upb.ro

However, some market researchers and user firms are in specific skeptical about its applicability and viability [4]. For these adoption obstacles major reasons are said to be risks of security (privacy of data), reliability (robust approach to services of application), and dependence of process (service quality and performance measurement). Also the virtualization of IT infrastructure and the hosted application provision has been regularly researched [5].

Factors influencing reluctance to SaaS are: business continuity, data security, vendor lock, accountability, customization, scalability, interoperability, and portability [6].

If SaaS has been acquiring familiarity, the bridge between large enterprises' IT decision-makers who were concerned about it and those who were either completely uninterested or partially concerned is too vast. To resist SaaS benefits, technology workers and researchers in large enterprises mention different reasons why it is not being adopted vastly outside the realm of small companies [7].

One of the major reasons why large businesses are reluctant to acquire SaaS is continuity of business [8]. The market atmosphere is filled with uncertainty that the SaaS vendors could simply run out of business.

Also, data security and provisioning based on quality of service rules are major issues for clients [9]. Because several enterprises are sensitive about their firm's data, they are reluctant to leave their information to 3rd parties. There have been issues about dishonesty of vendors in terms of accountability on actual speed and downtime rates. IT departments care for service outages and what type of assurances is offered to predict and fix such problems.

Innovations pose a modification of consumes, and consumer reluctance is a normal response [10]. Not all modifications are essentially healthy on its own, useful and desirable. Reluctance of consumers and their resistance psychology need to be taken into consideration in the promotion and development of innovations rather than thrust upon preconceived innovations. Therefore resistance to change is a normal response of consumers that has to be overcome if new services and products are to become agreed [11].

Whenever customers make determinations to buy new brands there is an uncertainty element about the perception and consequences of risk are included in most such buying [12].

Risk perception can be referred as consumer uncertainty perception that they face when they are unable to anticipate different consequences of their buying decisions. Relevant dimensions of risk are the consequences and the uncertainty [13].

It is worth noting that the risk influence relies on perception of the individual. This implies that the risk actually may or may not occur and even if an actual risk occurs it will not impact consumer behavior. Many situations may

impact the consumer perceptions of the consequences or uncertainty. For instance, there may be uncertainty about purchasing targets, understood possibly undesirable consequences or alternatives. Risk sensitivity, specific fear and attitude are critical factors in the perception of risk. Therefore, the perception of risk is compared to an expression of specific values [14].

Further fear is an emotional factor that is used to motivate consumers to purchase products [15]. The consumers do not describe their motives of purchasing due to the psychological fear that others will laugh at them or regard them as mad if they tell the actual motive being the purchasing of specific products. People who purchase security systems for their automobile or home are encouraged by the fear of having their vehicle stolen or their home burglarized. With the present outbreaks of death and illness from the consumption of products, motivation of the consumer to make sure the product bought is secure has developed. Marketers perceive emotional encouragement and use it to schedule marketing mixes that request to those motives [16]. When fear or punishment is attached to a product an action course will save a consumer from undesirable outcomes. The powerful models of risk perception are based on attitude; risk sensitivity and specific fear exist to provide a promising development in future.

The discrepancy between theory and real behavior is the heart of prescriptive intervention [17]. Prescriptive decision analysis is a more pragmatic approach focused on merging the normative and descriptive analysis ways within the decision making into a more practically useful approach for handling decision issues, and helping decision makers to solve real decision problems. Prescriptive decision analysis is cyclic with iterations through the steps of modeling values, identifying alternatives, evaluating, reflecting and possible remodeling of values, modifying or identifying new alternatives, re-evaluating etc. [18]. Mitigating risk in the SaaS environment is essential in order to establish a solid foundation for the data exchange. Following this, e.g., semantic web service-oriented architecture has been introduced in the Healthcare SaaS arena [19].

Objective and research methodology

The objective of the present research is to investigate the reasons behind reluctance of corporate consumers in Europe towards adopting SaaS solutions and, subsequently, to propose strategies for cloud computing developers in overcoming customer reluctance towards adopting SaaS solutions.

The research methodology has been structured based on the following cornerstones: correlative approach and qualitative analysis of relevant matters expressed by developers, customers, vendors, reference requirements; theoretical assumption of the model’s contents; implementation of the achieved structures in SaaS organizations; configuration and carrying out a survey, statistical analysis and interpretation of the results.

2. Prescriptive decision-making model on consumer reluctance

A proposed conceptual framework to understanding consumer reluctance is presented in Fig. 1.

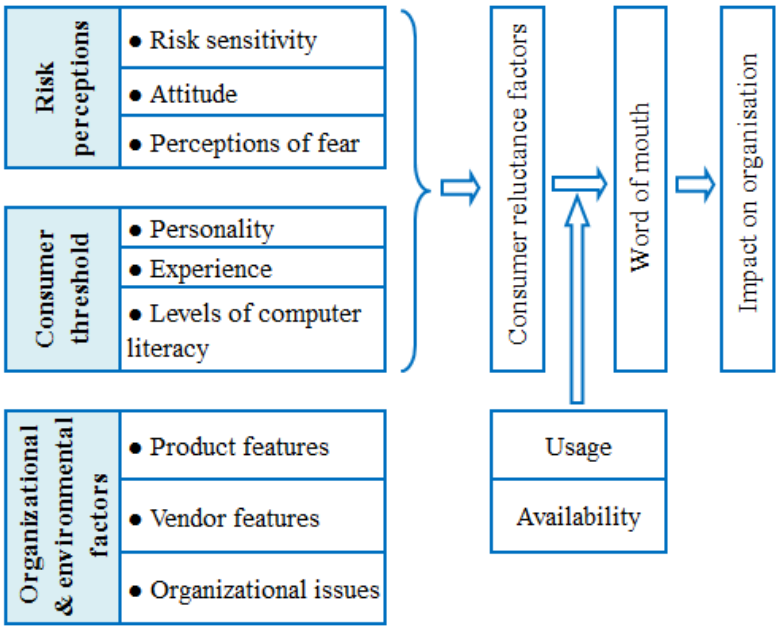

Fig. 1. Conceptual framework for consumer reluctance towards adapting SaaS solutions

The prescriptive decision analysis process has been adopted in the present research to a decision making model (Fig. 2).

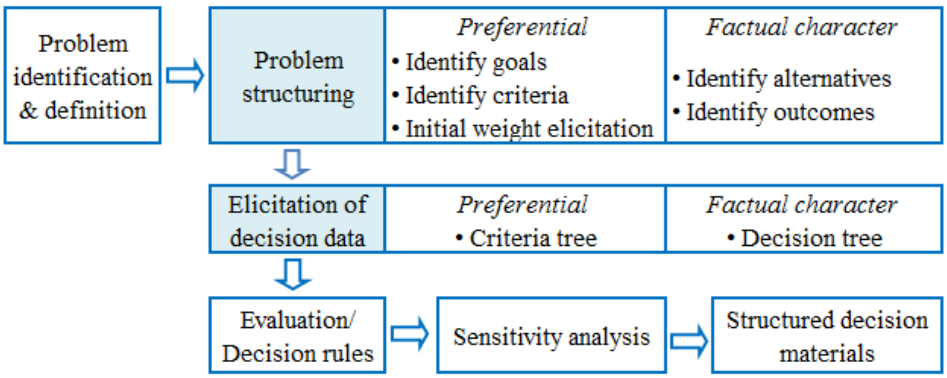

Fig. 2. Prescriptive decision-making model

3. Solution alternative development to overcoming technology risk

Based on a project where data was collected from 185 European Corporate buyers and 20 SaaS providers [20], it is clearly evident that the vendor's marketing strategy played an important role in attracting customers. The other driving factors are competitive edge, brand name, being motivated by success stories and by a trial. Similarly, the majority of the SaaS buyers prefer to recommend the implementation of SaaS in other departments, which indicates the high level of customer satisfaction. In addition, the results indicated that a number of corporate buyers intend to buy SaaS applications. This finding is consistent with the interview analysis with vendors, which indicated that it is possible to convince the customers and there is a growing demand for cloud adoption. Hence it is necessary to develop strategies to improve the adoption rate of cloud computing. The following section deals with identifying resisting factors and providing a framework to facilitate SaaS adoption. The major sources of reluctance are as presented in Fig. 3.

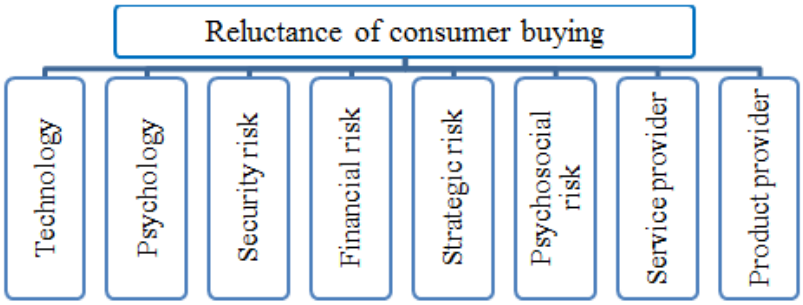

Fig. 3. Reluctance of consumer buying

Technology is the major barrier for the adoption of SaaS. The technological non-adopters are satisfied with the status quo and adopt "old school" technological practices. From the data analysis, it is clearly evident that even though the respondents possess adequate computer literacy there is a lack of computer skills with respect to SaaS implementations. Hence training is necessary which in turn increases financial risk. The respondents seemed to be scared of newer technology. Internet-based technologies and environmental uncertainties are unpredictable. Moreover, technological barriers include lack of user friendliness, data storage issues, information security and compliance issues as presented in Fig. 4.

The adopters indicated that advanced technological features of SaaS include a series of technology risks as presented in Fig. 5.

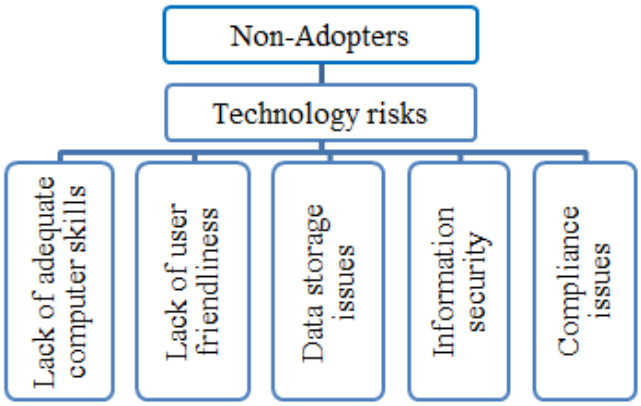

Fig. 4. Non-Adopters of technology risk

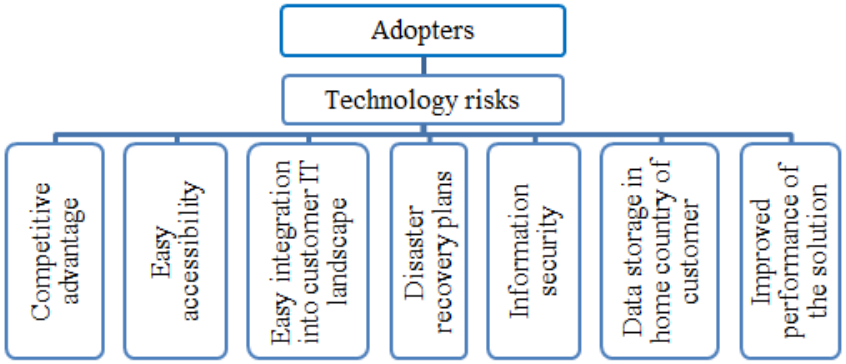

Fig. 5. Adopters of technology risk

With the help of adopting factors, the following alternatives are proposed to overcome the technology barriers (Fig. 6). Specific, intense training on SaaS is necessary to improve technology barriers such as lack of adequate literacy on SaaS and user-friendliness.

Programs centered on SaaS technological advantages such as reliable data service, desktop virtualization, cloud networking, back up services, superior data services and scalability would motivate buyers to adopt SaaS. Similarly, training should focus on creating awareness with regard to its advantages, performance and product features. Moreover, customer success stories help to motivate the technology non-adopters to adopt SaaS.

In addition, the product provider should develop software, which is easy to use and possess simple product features. Likewise, technological barriers can also be overcome by assuring adequate technical support to the buyers.

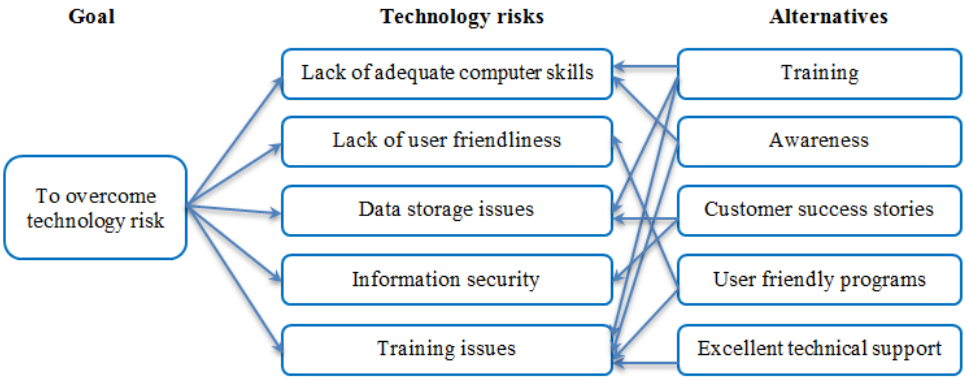

Fig. 6. Methods to overcome technology risk

The alternatives are ranked based on the weightage of the issues, which are identified through mean ranking of non-adopting factors. The analysis of results obtained from the survey of customers is presented in Table 1.

Table 1

Mean ranking for technology risk

Computer literacy	Mean	Ranking
I feel that my level of computer literacy is high	3.90	1
Successful application of cloud based services requires training for all employees, which is again additional cost to organization	3.15	2
I am avoiding cloud based solutions since it requires much computer knowledge to use them in real-time	2.33	3
Lack of adequate computer skills by even a single employee could result in disaster to organization if cloud based solutions are adapted	1.87	4

It is clear that lack of adequate computer skill is the major challenge for the adoption of SaaS by corporate buyers. This is followed by training issues, which are indirectly related to financial issues. Providing adequate training and awareness programs can solve both issues. Lack of user friendliness, data storage issues and information security are the other issues identified through interviews with SaaS providers. Hence, advanced user-friendly SaaS versions can be created to counter the user-friendliness issue and data storage issue. Moreover, training also helps to clear buyer's uncertainty regarding data storage and information security issues.

Strong technical support helps customers to clear their doubts with regard to operation, data storage and security issues.

Customer success stories also help to motivate customers by exhibiting their advantages, salient features, and ease of operations, easy accessibility and integration, improved performance and data storage.

The alternatives are ranked as presented in Table 2.

Table 2

Ranking of alternatives to overcome technology risk

Alternatives	Ranking
Training	1
Awareness programs	2
Advanced and user friendly program	3
Technical support	4
Customer success stories	5

Hence, the major alternative for overcoming technological barriers is training, and it is followed by awareness programs, user-friendliness programs, excellent technical support and customer success stories.

Prescriptive theory involves offering alternatives to a proposed solution rather than addressing an issue. In this research, alternatives are proposed based on the prescriptive theory using multi criteria decision analysis (MCDA) method. Hence, the alternatives are developed on the basis of adopting and non-adopting factors.

Both adopting and non-adopting factors differed in each risk barriers, only with the exception of psychosocial barriers. In the psychosocial barrier, reputation and image are the two main factors that affect both adopting and non-adopting barriers. In this research, most of the alternatives are relevant for one or more adoption barriers.

So, a framework to improve SaaS adoption rate using prescriptive theory has been developed based on the above alternatives (Fig. 7). Lack of training and awareness imposes a major challenge for the adoption of SaaS. Moreover, training and awareness programs help to overcome technology, psychological barriers, strategic risk, financial risk and psychosocial risk. Hence, training and awareness programs focusing their benefits and effectiveness are the need of the hour. In addition, a Service oriented architecture helps to enhance the interoperability between systems and thus overcome various risks. Furthermore, promotional strategies such as customer success stories, comprehensive payment schemes, free trial, pay per service help to attract corporate buyers by overcoming financial risk, psychosocial risk, service provider and product provider risk. All these alternatives help to improve the adoption rate of SaaS in the European region.

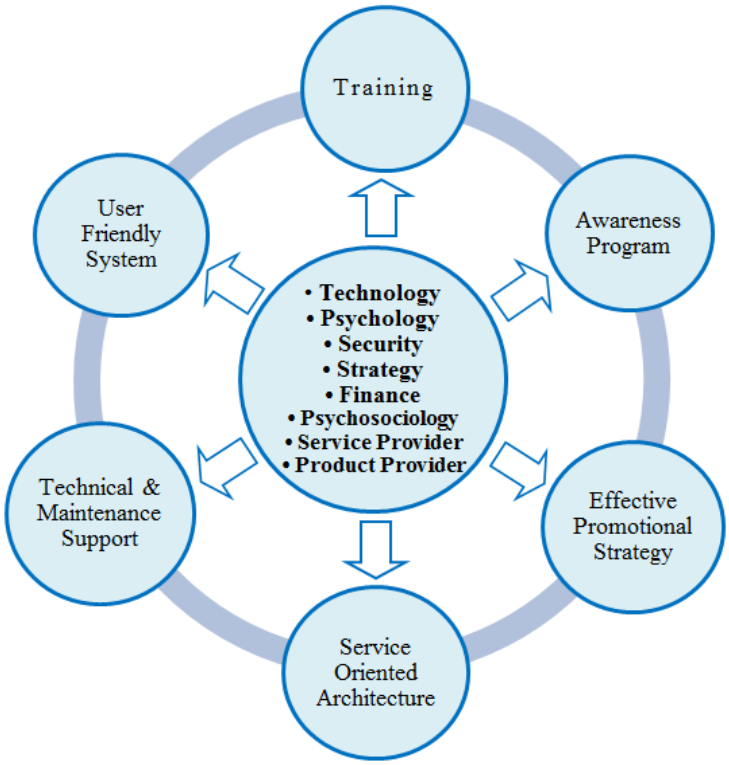

Fig. 7. Framework to improve SaaS adoption rate using prescriptive theory

4. Conclusions

Based on the perspective theory, an insight regarding the reluctance of SaaS deployments has been developed in order to improve the adoption rate of SaaS. Both SaaS adopters and non-adopters consider technology as the most crucial factor for their reluctance to adopt SaaS. It is necessary for SaaS providers to develop advanced SaaS versions, which are user-friendly and possess adequate security features. The providers should focus on training and awareness programs illustrating on SaaS advantages, lower total cost of ownership, easy accessibility, integrity, ease of operation, and other favorable factors. This would help to improve the adoption rate in the European region.

The present research acts as an eye-opener for corporate buyers who have over-estimated the risks related to SaaS adoption, especially technological risk, on one hand, and underestimated the performance features of SaaS on the other hand. It is recommended that non-adopters should compare the benefits and risks associated with SaaS and should utilize an appropriate decision-making strategy.

R E F E R E N C E S

[1]. *Gartner, Inc*., Gartner survey reveals 95 percent of respondents expect to maintain or grow use of SaaS, http://www.gartner.com/it/page.jsp?id=1812814, 2011.
[2]. *S. A. Mertz, C. Eschinger, T. Eid, H. H. Huang, C. Pang, and B. Pring*, Market Trends: Software-as-a-Service, Worldwide, 2008-2013, https://www.gartner.com/doc/ 1221513, 2009.
[3]. *C. Pettey*, Gartner Says 25 Percent of New Business Software Will Be Delivered As Software-as-a-Service, http://www.gartner.com/it/page.jsp?id=496886, 2006.
[4]. *G. Marks*, Beware the Hype for Software-as-a-Service, http://www.businessweek.com/technology/content/jul2008/tc20080723_506811.htm, 2008.
[5]. *E. Apostol, V. Cristea, Virtual Resource Management for Data Intensive Applications in Cloud Infrastructures*, U.P.B. Sci. Bull., Series C, Vol. 76, Iss. 2, 2014.
[6]. *T. L. Carte, C.J. Russell*, In pursuit of moderation: nine common errors and their solutions, MIS Quarterly, vol. 27 (3), pp. 479-501, 2003.
[7]. *A. Susarla,, A. Barua, and A. Whinston*, Understanding the service component of application service provision: An empirical analysis of satisfaction with asp services, MIS Quarterly, vol. 27 (1), pp. 91-123, 2003.
[8]. *M. Xin, N. Levina*, Software-as-a Service Model: Elaborating Client-Side Adoption Factors, Proceedings of the Twenty Ninth Int'l Conference on Information Systems, Paper 86, Paris, France, 2008.
[9]. *R. Marcu, D. Popescu and I. Danila, Healthcare Integration based on Cloud Computing*, U.P.B. Sci. Bull., Series C, Vol. 77, Iss. 2, 2015.
[10]. *E. J. Arnould*, Can consumers escape the market?, in: M. Saren, P. Maclaran, and R. Elliott, (eds.), Critical marketing. Defining the field, London, 2007.
[11]. *K. L. Blankenship, T. Y. Craig*, Rhetorical question use and resistance to persuasion: an attitude strength analysis, J. of Language and Social Psychology, 25(2), pp. 111-128, 2006.
[12]. *A. S. Cases*, Perceived risk and risk-reduction strategies in Internet shopping, The Int'l Review of Retail, Distribution and Consumer Research, vol. 12 (4), pp. 375-394, 2001.
[13]. *A. Angriawan, R. Thakur*, A parsimonious model of the antecedents and consequence of online trust: An uncertainty perspective, J. of Internet Commerce, vol. 7 (1), pp. 74-94, 2008.
[14]. *L. Sjoberg*, Risk perception is not what it seems: The psychometric paradigm revisited, in: K. Andersson, (eds.), VALDOR Conference, Stockholm, pp. 14-29, 2003.
[15]. *J. L. Burrow*, Marketing, USA, p. 162, 2011.
[16]. *I. Kim*, Consumers' rankings of risk reduction strategies in e-shopping, International J. of Business Research, vol. 10 (3), pp. 143-148, 2010.
[17]. *D. Bell, H. Raiffa, and A. Tversky*, Decision Making – Descriptive, Normative and Prescriptive Interactions, UK, 1988.
[18]. *S. French*, An Introduction to Decision Theory and Prescriptive Decision Analysis, IMA J. of Management Mathematics, vol. 6 (2), pp. 239-247, 1995.
[19]. *F. Moldoveanu, S., A. Cristescu, An Agent-oriented and Service-oriented Architecture in Medicine*, U.P.B. Sci. Bull., Series C, Vol. 75, Iss. 1, 2013.
[20]. *N. Fajic*, Consumer Behavior in SaaS markets, Project, http://consumerbehaviorsaas.word press.com, password: "SaaS", 2014.