Web 2.0 Revealed: Business Model Innovation through Social Computing

Abstract

The value of Social Computing and its application in business has largely remained unclear until now. However, this paper reveals that Social Computing principles may have important business value, as they can help to lower transaction costs through standardization on Internet. This makes the development here to stay, instead of another hype. This paper describes Social Computing with nine technological and social principles, obtained by comparing both Internet and academic sources in this field, being Open Platform, Lightweight Models, Enabling Services, Intuitive Usability, Long Tail, Unbounded Collaboration, Collective Intelligence, Network Effects, and User Generated Content. Through semi-structured interviews with thirteen experts the principles are validated and related to a generic business model. An hierarchical cluster analysis reveals three clusters of principles. The first cluster is labeled Open Collaboration and supports interaction with partners and customers. The second cluster is labeled Lean Configuration and supports a flexible and adaptive business setup. The third cluster is labeled Customer Value and supports enabling partners and customers in co-creating the value propositions of a business. The results show that Social Computing provides most support in those aspects of business where connections with the environment exist; the relations with partners and customers.

Keywords: standardization, transaction costs economics, Web 2.0, Social Computing, business model innovation

1. Introduction: Social Computing and Business Models

From around 2005, developments on Internet do sometimes draw comparisons to the Internet hype around the millennium, a bubble which popped. Currently too, a certain euphoria exists on seemingly unbounded possibilities coming with what has been labeled Web 2.0[1]. Its impact is not restricted to circles of technology adepts, but expands to the business world as well. Consider the amount of start-ups and acquisitions in the field of e-business, often in combination with astronomical sums of money. Apparently, corporations do not want to stay behind in these developments. More than half of the North American and European corporations consider Social Computing to be a priority in 2008 (Forrester 2008). Those investing in Internet technologies in the last five years are very satisfied with the results (McKinsey 2007). Many corporation are already rethinking their business models and say they have to make fundamental changes in their businesses. "*Business model innovation matters. Competitive pressures have pushed business model innovation much higher than expected on CEOs' priority lists*" (IBM 2006). The same research shows that outperformers in industry did place higher priority on business model innovation than underperformers did.

More and more indications appear, suggesting that Social Computing might be of value. But there are hardly any studies on why Social Computing is valuable. History provides interesting insights on technological developments like Internet and Social Computing. Few research too is available on how to apply Social Computing ideas in business. This will be examined in this paper, guided

[1] We use the term *Social Computing* in this paper, since it covers both the technological and social aspects of the intended developments. Web 2.0 is popular, but rather biased, and strictly speaking not accurate; the developments we are talking about occur on Internet as a whole, and are thus broader than just the Web.

by the research question: In which ways does standardization value Social Computing in supporting business model innovation?

This research will be explorative and qualitative, since the field of Social Computing is new, and not much scientific literature is available yet. Section 2 describes the goals of this paper. The subsequent chapters each elaborate on a different topic in this research. Section 3 describes the role of standards in technological revolutions, to provide analogies with the technologies in current developments. Section 4 gives a more thorough description of Social Computing. Section 5 elaborates on business models. In section 6, a data analysis yields the results of relating Social Computing to business models. Section 7 gives conclusions and discussion.

2. Innovate Business with Social Computing Principles

This paper shows the value of Social Computing by comparing recent development on Internet with historical technological developments. It shows that standardization and commoditizing play an important role for an innovation to lower transaction costs. These characteristics also give value to Social Computing developments. That makes it worth to look closer at this concept. Social Computing will be defined by searching for principles, which underlie the concept, with a comparative literature study in this field to find a common ground. To translate these principles to business, this paper relates them to a generic business model. To ensure objectivity and validity, experts are approached to find those relations, where Social Computing can support business. This results in three clusters, with focus on different aspects of a business model, making it possible to innovate business according recent valuable developments on Internet. This paper, therefore, aims to contribute to the research areas of Web 2.0, Social Computing, and business model innovation by integrating the concepts of standardization, Social Computing and business models.

3. Standards and Transaction Cost Economics

When looking in history, we can find some illustrative examples explaining the role of standards in technological revolutions. Around 1778, a French gunsmith Honoré Blanc pioneered in developing muskets from parts which were exactly the same for each musket; *interchangeable parts*. He created some muskets, disbanded them into separate bins and then reassembled the muskets from picking parts at random from each bin. Around 1800, Henry Maudslay pioneered with screw thread on interchangeable bolts and nuts, which became a practical *commodity*. It was a major advance in workshop technology. Not only because they were interchangeable parts itself, but also because they boosted *modularity*, since they act as connectors. In the late 1880s, the invention and standardization of electric current caused the so-called ‘War of the Currents’. The feud between alternating current (AC), promoted by George Westinghouse, and direct current (DC), promoted by Thomas Edison involved demonstrations including the electrocution of an elephant and the invention of the electric chair. Only since the wide acceptance of the AC standard, mass usage of electricity, and its commoditizing, ran off. What we can learn from these analogies is that standards in an industry support interchangeability, and interchangeability decreases complexness.

The same as for the aforementioned analogies holds for Internet too. The success of the World Wide Web depended mainly on open standards and interchangeability (Berners-Lee 2007). Therefore, “*the Internet creates value by reducing the costs of transmitting information. (…) [It] is a terrific advance in lowering the cost of information*” (Liebowitz 2002, 9). This can be achieved, because standards lead to better interchangeability between products and services, as we saw in previous section. Or in terms of ICT, lead to higher compatibility. Low compatibility leads to an unequal distribution of information between parties. This links us to the transaction costs economics; the value of transaction cost economics lies in the increase of efficiently managing uncertainty or complexity, leading to more equally distributed information, thus decreasing the transaction costs (Cordella 2001). In his influential work *The Nature of the Firm*, Coase mentions "*the costs of the price mechanism*" (Coase 1937), referring to transaction costs. Williamson extends with "*the economic equivalent of friction in physical systems*" (Williamson 1985, 17). In other words, transaction costs are the costs of making an economic exchange. With that in mind, looking again to Social Computing, we can conclude that the value of Social Computing lies in the decrease of transaction costs, even more then Internet already did. Why? Therefore we need to take a closer look on what Social Computing actually is.

4. Defining Social Computing

The first use of Internet by companies was to represent themselves online. Consumers used the Internet for finding information about companies, or other individuals. Instead of using the new technology of the World Wide Web as a new concept, with all of its new possibilities, it was used like an old concept; pressed media. This is a common seen behavior when using new technologies (McLuhan 1964). Since about 2001, Internet is used more in line with its possibilities (Tapscott and Williams 2007). Some suggest therefore that we are currently in the second era of Internet. Others think that Internet is now evolving into what it was intended to be. The opinions about these developments apparently differ from evangelists (O'Reilly 2005, Hinchcliffe 2006) to antagonists (Boutin 2006, Keen 2007). Many have used the concept as a buzz-word for their own varied marketing purposes, making it even more vague. Therefore, we look for principles underlying these Social Computing developments. With principles we mean not just bare examples, cases, or techniques, but fundamental ideas, or basic rules.

4.1 Nine Principles

We used both Internet sources, since it is the platform presenting the newest opinions and discussions in this field, which makes it a necessary source for up to date information, as well as scientific sources, if any. All used sources do attempt to define Social Computing in a way. O'Reilly seeks principles (O'Reilly 2005), Hinchcliffe goes for key aspects (Hinchcliffe 2005), Hoegg et al look for fundamentals (Hoegg, et al. 2006), McAfee finds ground rules (McAfee 2006), and Vossen and Hagemann stick to essences (Vossen and Hagemann 2007). For this research, we did a deductive comparison as described by Doorewaard & Verschuren (200053) to compare the different elements of their definitions to each other, which is presented in table 1. We used the data analysis method of Miles & Huberman (199411-12) to compare the different sources and to find a common ground. The last column shows the result of this analysis by presenting the labels of the abstraction of each row. These are the nine principles underlying Social Computing.

O'Reilly principles, design patterns and core competences	Hinchcliffe key aspects	Hoegg et al. fundamentals	McAfee ground rules	Vossen, Hagemann essences	This Research
Data is the core	Data consumption and remixing from all sources, particularly user generated data	Information enrichment		Ways to utilize and combine data and data streams	**User generated content**
Network effects as more people participate	Architecture of participation that encourages user contribution	Mutually maximize collective intelligence	Network effects	A socialization of the Web, where a user makes personal entries available to the general public, and where this often leads to an improvement of the underlying platform	**Network effects**
Harnessing collective intelligence			Support emerging of knowledge		**Collective intelligence**
Cooperate with users as co-developers		Creating and sharing of information			**Unbounded collaboration**
Leverage the long tail					**Leverage the long tail**
Lightweight and rich user interfaces	Rich and interactive user interfaces		Easy to use offerings	Functionality- as well as service-oriented approaches to build new applications as a composition of other, and in order to enrich user experiences	**Intuitive usability**
Cost-effective scalable services instead of software		Dynamic services	Technologies that let users build structure over time can coexist peacefully with those that define it up front		**Enabling services**
Perpetual beta	Continuous and seamless update of software and data, often very rapidly				
Lightweight programming models and business models					**Lightweight models**
Software above the level of a single device	The Web and all its connected devices as one global platform of reusable services and data	Formalized interaction	Online platform with a constantly changing structure build by distributed, autonomous and largely self-interested peers		
Web as platform					**Open platform**

Table 1 - Comparison of Social Computing definition elements.

An *Open Platform* is an accessible platform like, but not restricted to, Internet. The platform evolves to an online operating system, including its services. It is open in that it is accessible and will emerge when used over time. *Lightweight Models* refer to the setup of services and business model. This should be agile and lean, to be able to easily anticipate on, and be adaptive to, a changing environment. *Enabling Services* are interchangeable dynamic software services offered on the open platform. They are enabling in that in their essence they are compatible and interchangeable with other services. *Intuitive Usability* ensures the ease of use of these services, offering rich user experiences making them very accessible. The previous, technical principles enable to focus for partners and customers on the *Long Tail* which is made possible since previous principles enable reaching niche relations and customer self-service. The technical principles also pave the road for *Unbounded Collaboration* on the mentioned platform, between individuals, but also in respecting users as co-developers, independently of place and time. All users on the platform add value, which can be used as *Collective Intelligence*, acknowledging that a collective can develop equal or even more intelligence than a few experts can. *Network Effects* occur when an increasing amount of users is active on the platform using its services, and therefore increase its value. *User Generated Content* refers to the content on the platform in its broadest form which is more and more generated by users.

The first four principles are technological and lower transaction costs, since searching, editing, and reaching of content and services becomes more easy, more accessible, increasingly efficient, or cheaper The last five principles are social and emerge due to lower transaction costs. The principles are depicted in Figure 1, in a more structured way, with technical enabling principles at the bottom, to more social resulting principles at the top. Based on these principles, we would refer with Social Computing to a development where technologies enable empowerment of individuals, or groups of individuals, to express themselves in a more natural way, leading to easier creation, enriching, sharing, and finding of content.

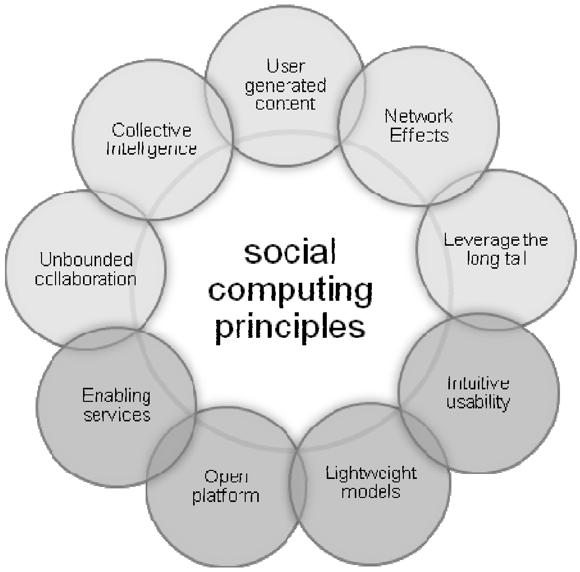

Figure 1 – The nine principles of Social Computing, of which the bottom darker four are technology oriented and the upper lighter five are socially oriented.

5. Business Models

To see where in business Social Computing can be supportive, we will relate them to a business model. A generic business model is a tangible tool to point out which aspects of an organization can be supported with the Social Computing principles. The increasing impact of Social Computing on business “*should (…) not be neglected from an academic perspective. New business models arise and existing business models are highly affected by Web 2.0 communities*” (Hoegg, et al. 2006). Chesbrough stresses the need of a business model by explaining that the commercializing of an innovation does not exists in the product or service using the new technology, but in the business model which underlies that product or service (Chesbrough 2003). Osterwalder did a thorough research to the origins and developments of the business model, and gives a useful representation of most recent literature on this topic. He defines a business model as: “*... a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm*” (Osterwalder, Pigneur and Tucci 2005). His generic business model is depicted in Figure 2.

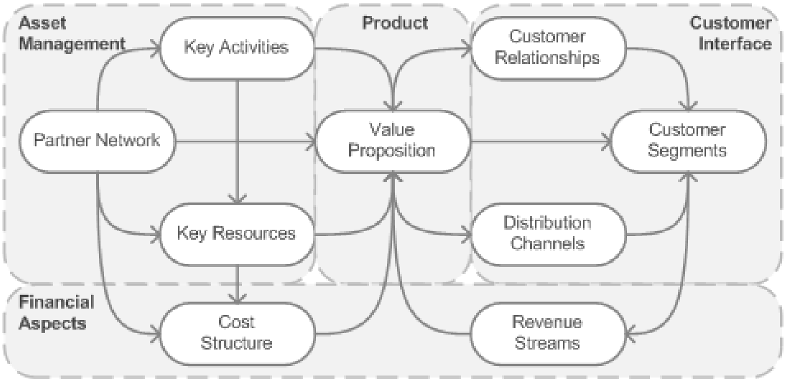

Figure 2 – The business model and its building blocks (Osterwalder 2005b).

The *value proposition* is what a firm offers to the market, or the next shackle in the value chain, which satisfies in a specific need. *Customer segments* are groups of customers with similar needs to which a firm offers their value proposition. *Communication and distribution channels* are channels through which a firm communicates with their customers, and through which it offers its value proposition to them. *Customer relationships* describe the type of relation a firm maintains with each customer segment, for each value proposition. The three building blocks last mentioned represent the *customer interface*, which needs to convert your offered value proposition into *revenue streams*. But the value proposition has to be created. *Key resources and competencies* describe which resources a firm owns to do so. These resources yield the needed value with a proper *configuration of key activities*, the design of internal processes of a firm. Most firms collaborate within a *partner network* to obtain necessary resources from others for the intended value proposition. These partners not only could be previous shackles within the value chain, but might be customers as well, when more networked. The three building blocks last mentioned represent the *asset management* part of the business model, and bring a certain *cost structure*. The financial result of a firm is determined by combining both *financial aspec*ts of the business model.

6. Data analysis

6.1 Methodology

To relate the Social Computing principles to the building blocks of a business model, we use semi-structured interviews. 10-15 experts in the field of Social Computing and business models are sufficient for our explorative research, since the research is qualitative (Miles en Huberman 1994, 27). An expert is considered someone familiar with Social Computing and business models, someone within an organization who is responsible for innovation of business processes, or a scientist in one of these fields. Many would fit in these criteria, so we approached people with some status, either as opinion maker, authority according media, advanced scientist, or possessing a higher business position.

The freedom of a semi-structured interview gains the possibility to achieve a lot of insights from the experts. We will pose the same questions, to be able to compare the experts' answers. But we also want to give room for their ideas, opinions, and thoughts about these subjects and how to relate them. We created a matrix with the Social Computing principles on one axis and the business model building blocks on the other axis. The experts were asked to mark those field in the matrix of which they think according principle can support according building block. Besides all the textual and descriptive information, this will be a main indication to find where Social Computing can support business. We found thirteen experts conform the criteria willing to meet up. We coded the interviews and isolated the keywords and key-phrases concerning Social Computing and its relation to the business model. Next, we collected their filled matrices.

6.2 Expert Coherence Analysis

First, we look at the keywords or key-phrases mentioned by the experts when describing Social Computing. They almost all fitted in one of the principles we found. Some keywords not fitting were mentioned by only one expert. Therefore we conclude that the experts agree with us on the principles we found when describing Social Computing developments.

Next, we look at the marks placed by the experts in their matrices, see Table 2. The second column shows how many marks an expert placed in his matrix. The matrix contained 81 fields. The amount of marks placed by the experts differs from 15 up to 72, which makes it difficult to compare cases. But we did not want to impede the experts with presumptions, so we let them free in their amount choice. Some sort of an index is needed, to be able to compare the experts. This goes in steps. The third to seventh column show the amount of fields an expert marked that no other expert marked, one other marked, two others marked, three others marked, and those counted up. For instance, Expert01 marked one field that no other expert marked, Expert04 marked five fields that three others marked too. Obviously, when an expert has marked many fields, the 'total sole marks' value will be higher. Therefore we divided the total amount of seldom marked fields by the total amount of fields an expert marked. This is the index depicted in the eighth column and gives an indication of the experts agreement, or coherence. The reasoning is that when this total is high, the expert is in disagreement with other experts. With this coherence index we can compare the experts, and find, for instance that, although Expert04 and Expert12 marked 43 fields, they have a rather low coherence index of 0,16. On the other hand, Expert09 marked only 29 fields, but has an coherence index of 0,41, which is the highest. The expert most coherent with the others is Expert10, with no fields marked that none or few others marked as well. Overall, the coherence indices are low, indicating an agreement between the individual experts on which Social Computing principles supports which business model building block.

Expert ID	Total marks	Unique marks (0 others)	Sole marks (1 others)	Sole marks (2 others)	Sole marks (3 others)	Total sole marks	Index
01	51	1	1	3	10	15	**0,29**
02	72	0	2	4	15	21	**0,29**
03	33	0	1	1	2	4	**0,12**
04	43	0	1	1	5	7	**0,16**
05	37	0	0	0	5	5	**0,14**
06	15	0	0	0	2	2	**0,13**
07	41	0	0	2	6	8	**0,20**
08	20	0	0	0	1	1	**0,05**
09	29	0	1	3	8	12	**0,41**
10	21	0	0	0	0	0	**0,00**
11	30	0	0	0	2	2	**0,07**
12	43	0	0	1	6	7	**0,16**
13	17	1	0	0	2	3	**0,18**

Table 2 - Overview of the amount of marks placed by each expert.

6.3 Matrix

Counting all marks from the experts, results in an overall matrix, as depicted in Figure 3. Per field, the matrix shows numbers, referring to how many experts marked a relation between the principle in the row and the building block in the column. We need to approach this data descriptive, since a qualitative explorative research forces us to look modestly to what can be seen in our few cases.

The highest amount for a relation could be thirteen, but there are no fields marked thirteen times, indicating there is no one relation confirmed by the experts altogether. The most often marked relation appears to be between Unbounded Collaboration and Partner Network. Twelve out of thirteen experts think the principle of Unbounded Collaboration can support developing a Partner Network. This is not a surprise, we believe. First, some experts noted that the principle and the building block are almost the same. This is not the case, a network is a result of collaboration. When you consider that organizations more and more become networked with collaborating entities, this relation becomes stronger. Also users are more and more involved in product development, making them sort of partners for that organization. This is confirmed when we look at less stronger relations, where Unbounded Collaboration is related to Customer Relationships.

There appear no new fields when looking at eleven or more marks per field. Looking at fields marked ten or more times, two new fields appear, being User Generated Content supporting Value Proposition, and Lightweight Models supporting Cost Structure. The first one can be explained by that the experts are aware of the fact that users more and more are able to share and enrich content, instead of getting content provided by an organization. If content is the Value Proposition for an organization, the relation is even more understandable. The second relation is a little harder to explain. But Lightweight Models covers agility, scalability, and leanness of an organization, which is important because the environment is changing faster and faster. In such a situation, having a flexible business model helps keeping costs low when you have to change your organization setup.

One more step down, facing nine or more marked fields, a sudden increase to eleven relations appears. Especially the relations with Customer Relationship draw attention since there are four of them in this view. Accordingly, we believe the experts do see that many of the Social Computing principles can support the relation with the customers of an organization. Interestingly to notice, the two building blocks Customer Relations and Partner Network are the most important connections of an organization to its environment. Exactly in those parts of the business Social Computing can be supportive, according to the experts. Those are the places with probably the most dense information transferring, to suppliers, between input and throughput, and to customers, between throughput and output of an organization.

More steps down increases the amount of relations each time. But more remarkable are the columns where marks stay out. At seven or more marks, Revenue Streams and Key Recourses and Competencies are still not related to any building block. Customer Segments and Cost Structure do only have one such a relation, being respectively Long Tail and Lightweight Models. For the financial aspects, we believe that experts might have seen these building blocks more as results, or as derivates, of the business model parts they represent. Asset Management for Cost Structure and Customer Interface for Revenue Streams. But why the other two columns, Customer Segments and Key Resources and Activities, remain empty is unclear to us now.

Finally, the row that remains most empty is Intuitive Usability. At only two or more required marks, the only field not marked are this principle in relation with both Partner Network and Cost Structure. This indicates that experts do not see any strong support for Intuitive Usability within business, especially not for supporting a partner network or cost structure. Viewing one or more relations makes all fields marked, indicating every field has been marked at least one time by one of the experts.

Approaching the data more statistically, a frequency overview of both the principles and building blocks reveal that all relations are well covered, though they do not vary much in amount compared to each other. Of the principles Unbounded Collaboration is marked the most, and Intuitive Usability is marked the least. Of the building blocks Customer Relationship is marked the most, and Key Resources the least. But differences are small. An overview of how often each amount of marks appears, a frequency distribution, tend towards normal.

		Business Model Building Blocks									
		Customer segments	Value proposition	Com and distr channels	Customer relationship	Revenue streams	Key resources	Key activities	Partner network	Cost structure	**Total**
Social Computing principles	Long Tail Focus	9	5	7	5	5	3	3	4	6	47
	User Generated Content	4	10	4	9	6	4	4	4	5	50
	Open Platform	3	5	6	5	4	6	6	9	6	50
	Intuitive Usability	6	5	4	9	2	2	4	1	1	34
	Collective Intelligence	3	7	4	9	4	6	7	9	6	55
	Network Effects	3	7	9	6	4	2	4	4	6	45
	Lightweight Models	5	6	5	5	5	6	8	6	10	56
	Enabling Services	5	4	7	8	5	4	7	7	6	53
	Unbounded Collaboration	5	6	8	9	5	5	6	12	6	62
	Total	43	55	54	65	40	38	49	56	52	452

Figure 3 - Burn chart matrix of the results of the expert interviews.

6.4 Clusters

Although we do have just a few cases, which makes statistical analysis hard, and not as reliable as when more cases were used, we like to make groups of the principles. Since there is more than one case, and no assumption made about the amount of clusters, we attempt an hierarchical cluster analysis. Since the clusters need to be created from actually distinct groups we use a complete linkage method. The most common measure is the squared Euclidean distance, which will be used. It is the best way to find a dendogram, of which the result is depicted in Figure 4. Between thirteen and fifteen the principles are joined into three clusters. The distance in less than half of 25, which makes it reasonable to take these three clusters.

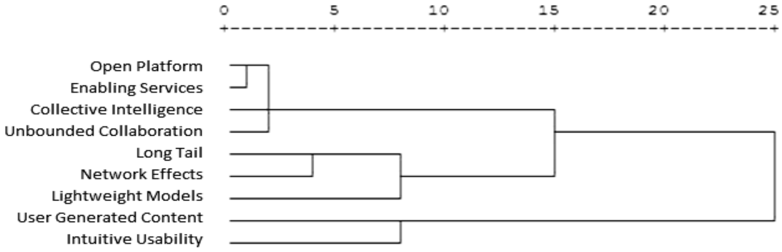

Figure 4 - Dendogram of the cluster analysis of the principles

The first cluster contains principles covering openness, accessibility, remixability, and interchangeability, as basis for collaboration without boundaries. We choose therefore the label *Open Collaboration*. The second cluster contains flexibility, scalability, and focus on all users. We chose therefore the label *Lean Configuration*. Finally, the third cluster contains principles focusing on the users and how and what they contribute. We choose therefore the label *User Value*. We can find which building blocks are most strongest related to the principles in each cluster when looking back to the matrix. The first cluster highly supports both Customer Relationships and Partner Network. The next cluster mostly supports Customer Segments, Communication and Distribution Channels, and Configuration of Key Activities. The third cluster mostly supports Value Proposition, Customer Relationships, and Partner Network, we think the user might also be a partner. The three clusters reveal where the Social Computing principles most support the business model, see Figure 5. At these places most possibilities exist for business model innovation supported by Social Computing principles.

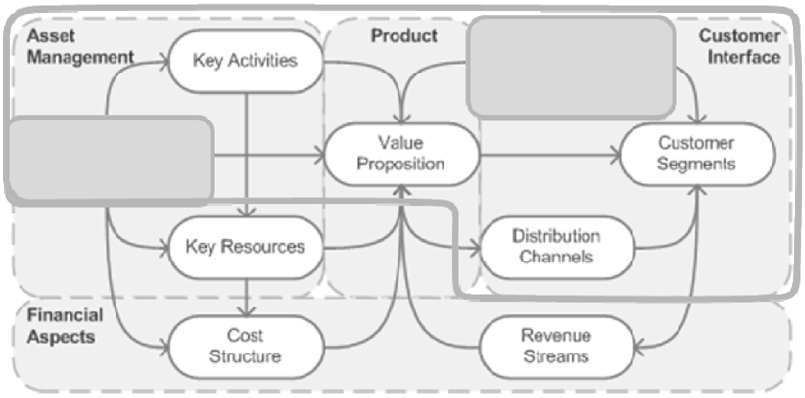

Figure 5 - Social Computing support for an organization mapped on a business model.

7. Conclusion and Discussion

This research showed that the parts which are best supported by Social Computing are Customer Relationship and Partner Network. But also Value Proposition, Communication and Distribution Channels, and Configuration of Key Activities can be supportive in business. Many of those building blocks with a strong relation to Social Computing, connect the business to its environment, which is assumed to be the main reason why actually these building blocks can be supported with Social Computing. Recent developments show a standardization and commoditizing of ICT and its tools which will lead to lower transaction costs in the area of information transactions. Most of these transactions take place between a company and its partners and customers, in the transformation from input to throughput, and from throughput and output of an organization. Next, partners, including customers, also can be of high value in co-creating a value proposition. This is because standardization and commoditizing make information sharing, finding, and enriching more accessible to individuals. It does need an adjustment of the key activities of a company, and an adjustment of the channels to reach the customers which can be assumed the main reason why those building blocks are affected as well by Social Computing. These building blocks especially do need thorough consideration for Social Computing support in a business model innovation process.

The value of a qualitative research depends on both reliability and validity (Miles en Huberman 1994, 277-280). Reliability has been taken care of by describing the research method, and approaching Social Computing experts for the interviews. The results were presented step by step, explaining our decisions, and mentioning limitations when we approached the few cases more statistically. For validity, we found that the Social Computing principles model was agreed upon by the experts. Next, the corresponding results between what the experts mentioned in describing Social Computing and what the matrix revealed, conformed each other. Overall, the research has been low scale, focusing on the principles, and relating them to a generic business model. This makes specifying the results to a certain industry or business difficult, because there are many industries with even more business models. Some experts found it hard to mark relations in the matrix, for there would be missing a user axis.

A few building blocks were not covered by one of the clusters. The experts probably saw the Financial Aspects as derivates of both Asset Management and Customer Interface. Key Resources, apparently, is decreasing in importance when innovating a business, according to the experts. But here are opportunities, since schools of thoughts exist, dedicated to exactly that relation. This is called Enterprise 2.0 (McAfee 2006), which actually is a form of knowledge management (Senge 1992) or organizational learning (Nonaka and Takeuchi 1995). Intuitive Usability appears to be the least important principle, according the experts. To our opinion, intuitive usability can very well lead to lower transaction costs for sharing, finding, eliciting, and enriching content. Intuitiveness of these possibilities make them more accessible. To provide more foundation for the findings in this paper, and to make the statistical analysis more reliable, it would be interesting to make current qualitative research more quantitative. Next, developing a maturity model, with quick scans, rating the maturity of a principle within a service, could help service providers redesigning their business model. To specify such a guide a user differentiation could give more insight to each industry, value discipline, user role, and so on, according the differentiation.

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