Peripheral Innovation in the Social Media Ecology

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ABSTRACT
In this paper, we examine the ecology of social media, in that the ways users consume social media have inadvertently led to the fragmentation of personal data and artefacts in such a way that makes service design and innovation difficult to cater for the masses. Rather than hoarding the user-generated data, major incumbents have begun to adopt an open API strategy as a way to induce creation of mashups by developers to complement their core services. This strategy harnesses the strength of weak ties to sustain the ecology and notably strengthen the incumbents' positions. This degree of openness through the use of API not only focuses incumbents' resources on their core services but also induces independent developers and new startups to tinker and experiment new services at a peripheral location. We use the case of Twitter to illustrate how an open API strategy works, and to underscore the role of developers as an innovation gatekeeper in bridging an otherwise fragmented social media landscape.

Categories and Subject Descriptors
H.1.1 [**Models and Principles**]: System and Information Theory– *Value of information*

General Terms
Management, Measurement, Economics, Theory, Legal Aspects,

Keywords
Open API strategy, service logic, peripheral innovation, weak ties, long tail

1. INTRODUCTION
The ecology of social media revolves around a few incumbents with hundreds and thousands of digital artefacts (such as blogs, photos, and videos) uploaded and shared daily by their users. Incumbents such as YouTube, Twitter, Facebook are synonymous with online videos, micro-blogging and social networks. Each characteristic defines the core service of the respective incumbent. There is little differentiation technologically speaking as each incumbent can copy each other and offer their users similar and all-inclusive social media tools and services. Yet technology alone does not give the incumbent the competitive edge. It seems that the first-mover advantage dictates towards which social media site individual users will gravitate. It is not unusual to find social media users to consume a wide range of tools, and their online activities scattered and varied according to other network effects and conditions driven by the media choices that their friends and/or acquaintances made. Take online chatting, rather than using the chat facility that Facebook offers, users are likely to use other media including Skype, Google Talk, and/or MSN Messenger. Also with users' digital artefacts and traces of their digital footprints distributed across different media sites, this makes it harder for each incumbent to anticipate needs and create a sufficient variety of services to cater for the masses. The dominant players have to radically rethink their strategy. In the past few years, we have witnessed a radical change in strategic thinking, rather than hoarding on user-generated data, they release the data through the use of an open API, aiming to induce contributions from external developers with a view that developers are more likely to be both a producer and a consumer of social media services. This prosumption not only enhances digital innovation in a peripheral sense but also complements the core services offered by the dominant players.

This paper examines the service logic of Twitter's open API strategy, and its impact on developers as an innovation gatekeeper in meeting the so-called long tail requirements in social media consumption. The premise of our argument is that an effective API strategy should be able to attract developers' attention and effort to develop apps and/or services to complement their core services, in that developers add values to the users by performing an important bridging function across otherwise fragmented collections of digital artefacts. Several questions remain: "*Does it matter how much control to relinquish in relation to the permissible level of peripheral tinkering?*"; "*What is the degree of openness in formulating an open API strategy?*"; "*Is an open API a viable business model?*"

2. API Strategy and Weak Ties
User-contributed data and artefacts in the public domain which are socially visible in social media sites possess some of the key characteristics of a public good, in that it does not exclude anyone from using it to develop services (non-excludability), and the consumption by one party does not diminish the value nor the ability of others to consume the same (non-rivalry). With the traditional business logic that *customer insight is proprietary*; the social media providers are not obliged to release the data. Yet the pros can outweigh the cons through the release of the data through API, if it can induce creative use by external developers and importantly, increase the recombinant capability of the incumbents. This capability forms the dynamic resources, which are inherently relational, harnessing the contributions of independent developers and new startups. They are by default weak ties. Perhaps the mostly cited theory relating to the dynamic aspect of network resources is Mark Granovetter's theory of the strength of weak ties [1]. Essentially, weak ties provide the conduits of new resources including new knowledge

and information by bridging networks of networks that are out of reach by cohesive networks characterized by strong ties. By opening an API it instigates the conditions for weak ties formation, which increases the liquidity of the interchanges across different social media sites, and that in turn creates novel and complementary services to the core services.

Technically, a web API (Application Programming Interface) is a defined set of HTTP request messages along with a definition of the structure of response messages, typically expressed in JSON or XML. While "web API" is sometimes considered a synonym for web service, the Web 2.0 applications typically have moved away from SOAP based towards more direct REST style communications. REST style encourages the combination of multiple services easier into new applications known as mashups [2]. Because mashups are built using APIs, we would be able in a variety of ways to view the relationship between a mashup and any supporting APIs used to create that application.

3. Research Methodology

We developed a Python script to collect data on the ProgramableWeb.com, which listed all the major APIs and mashups in the social media marketplace. We collected information about each web service including category, tags, developers, date and inter-dependency between mashups and APIs to construct the social media ecology. At the time of data collection in August 2011, there were **3712** APIs and **5997** mashups. The majority of the listed APIs are provided by incumbents, such as Google, Twitter, Facebook, and Flicker; a minority are hosted by individual developers and/or new startups. All mashups were created by individual developers.

In general, mashups involved integrating multiple information sources across two or more APIs. The integration represented a novel and unique way of combining data and information to create new services, which complemented the incumbents' core services. We found two variants of service complements or complementarities. The first and most frequent type was based on integrating information through multiple APIs (e.g. ***api A1 + api A2 => mashup M1***). Whereas the second type was based on one listed API (e.g. ***api A3 => mashup M2***) and combined it with other external information sources including scripting data. This type of complementarity was commonly found with tool service API such as the Google Maps API.

To graphically represent the relational aspects of the social media ecology, we represent each ***api Ai*** and each ***mashup Mi*** by a node, and connect by direct edge those APIs on which a mashup depends, i.e. there exists an edge from ***Ai*** to ***Mi*** iff ***Mi*** depends on ***Ai***. The number of edges leading away from a node is said to be the outdegree of that node; the number of edges leading into a node is the indegree. Figure 1 shows the interlinkages of APIs to mashups in the entire social media ecology. The diameter/area of each node is proportional to the node's outdegree. The outdegrees indicated the number of mashups that were derived from the apis, so that the smallest node was mashups, and the bigger nodes were APIs. Given the word limit, we selected the linkages based on the variant use of the Twitter API to show the unique ways developers combined Twitter API with others (as shown in Figure 2).

4. Discussion & Conclusion

Similar to the platform leadership strategy, the success of an open API strategy is driven by the degree of openness and is sufficient to induce involvement from external parties. In the case of Twitter, the terms of use are less restrictive, in that so long as third party services are not duplicating the core services of Twitter, novel mashups can be created. This non-restrictiveness contributes to the attractiveness of the Twitter business ecosystem, in that Twitter as the incumbent does not enter the complementary markets. If it does, it is likely that it will deter other parties to come into the business ecosystem as complementors [3]. Also, by not entering into the complementary market, it attracts most developers' attention and resources (as shown in Figure 3), and directs more traffic and generates more revenues through subscriptions through the use of its API. In comparison to Twitter, we found that not all social media sites with open API attract the same level of developers' attention. Figure 3 represents the distribution of mashups per across some of the major APIs. We found there is a direct relationship between the degree of openness (restrictiveness in the terms of use) and the number of mashups created.

Also the platform strategy [4] can be used to explain why API strategy is successful. One aspect of platform strategy is to developing a core technology that is useful and reusable to others. Case study on Twitter service ecology (Figure 2) demonstrates that Twitter can be applied in diverse ways to meet the long tail demands in the ways users consume social media. The second aspect of the platform strategy is to encourage developers and third parties to switch from developing for one media to the other through lowering the entry barriers of adoption, by making it easily to use and adopt the core technology. Twitter API administrators always listen and adapt to other APIs together used for mashups, so mashups developers would have less technology difficulty for innovation. It enables Twitter to become a successful innovation platform.

Incumbents should acknowledge the role of developers as innovation gatekeeper. Most of digital innovation occurs external to the major social media sites, at a peripheral location rather than within the core through mashups. We calculated that one mashup would combine 13.2 different APIs in average. The distribution of average APIs for mashups also follows power law as a scale-free distribution (Figure 4). Less than half of mashups built on single API. More than a third of mashups involves three or more APIs. The study of Twitter allows us to establish a set of useful metrics to gauge the vitality and the contribution of open API to the social media ecology. We intend to compare and contrast Twitter with other major incumbents to better understand how open API and in particular the degree of openness can be used a disruptive strategy for digital innovation.

5. REFERENCES

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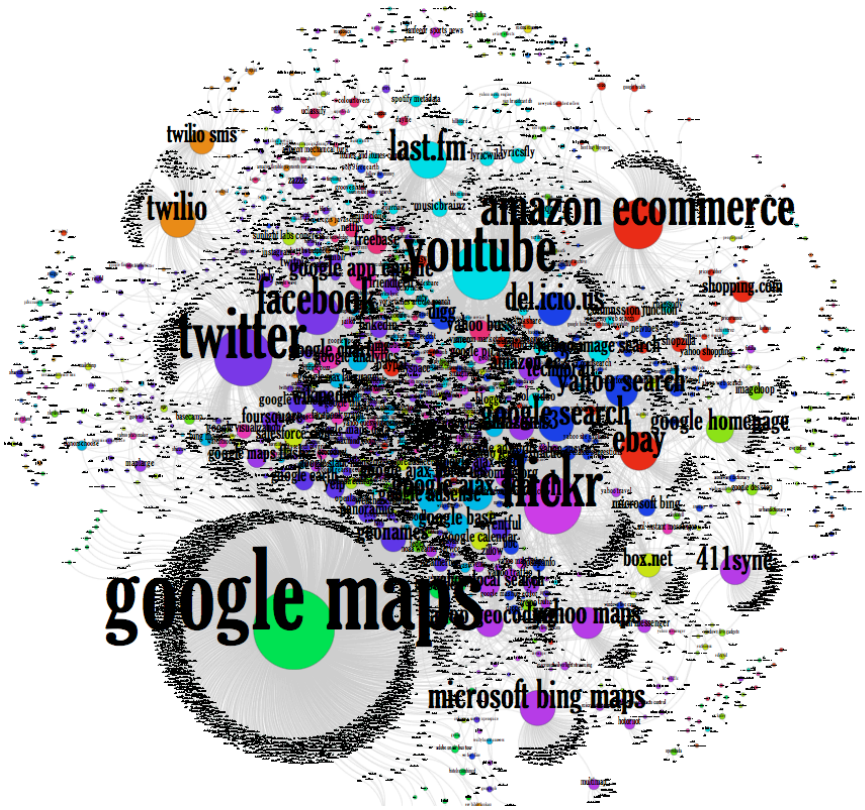

Figure 1: whole service ecology study. Each edge is a direct link from api Ai to mashup Mi. This network includes 3712 APIs and 5997 mashups.

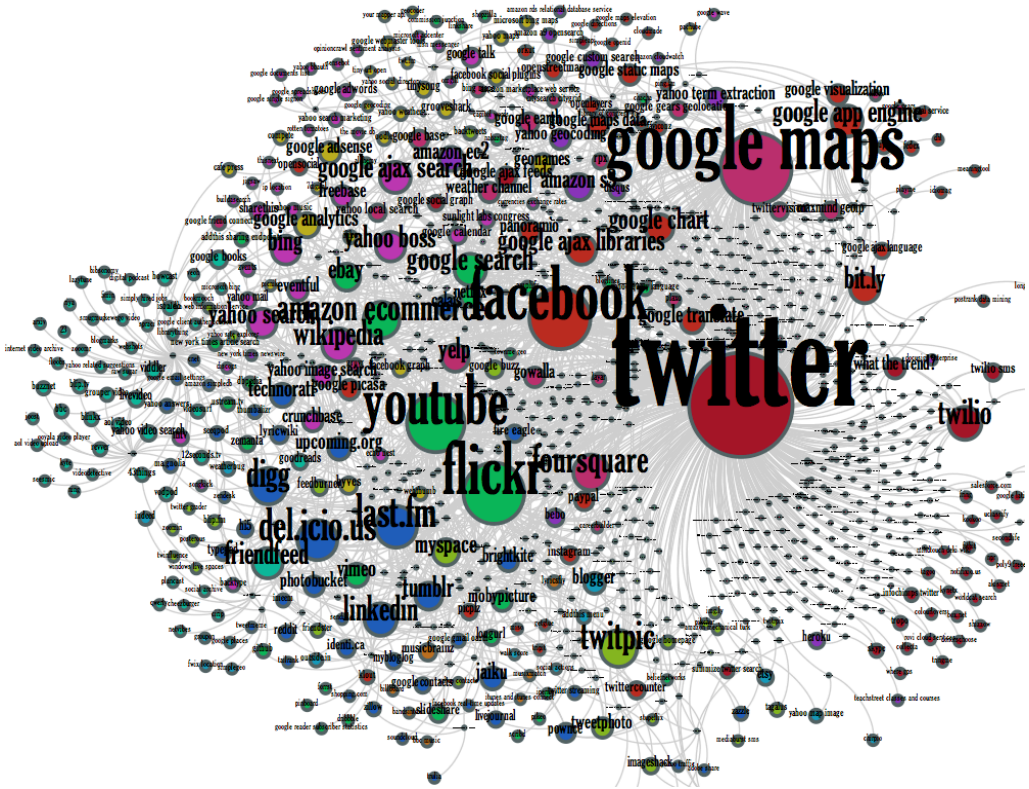

Figure 2: Twitter ecology study: we select out all the mashups depend on Twitter API and then all other APIs those mashups also use. There are in total 602 mashups and 364 other APIs.

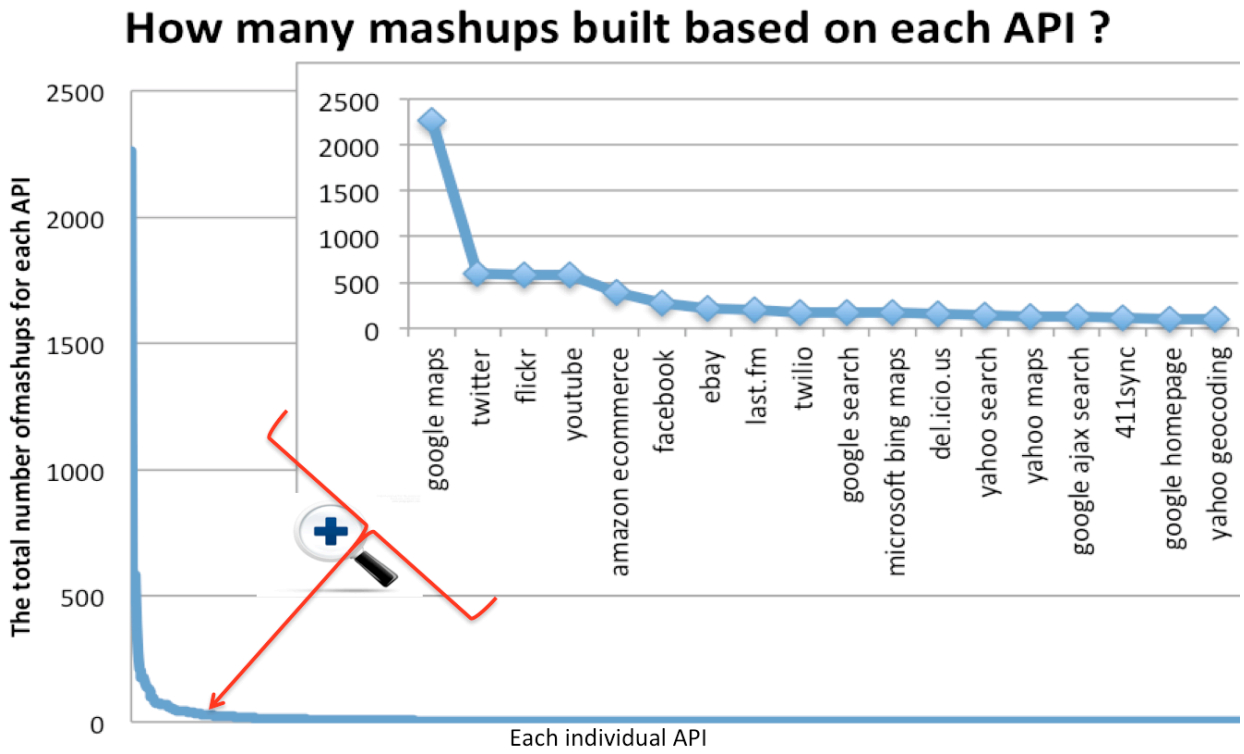

Figure 3: distribution of how many mashups are built based on each API. The x-axes represents each individual API, which can be understand as the id for each API. The small chart embedded on top right is a snap zoom out of most left hand of main chart. The left head of line shows API would be used by large number of mashups, and the right tail demonstrate small number or none of mashups depend on this API.

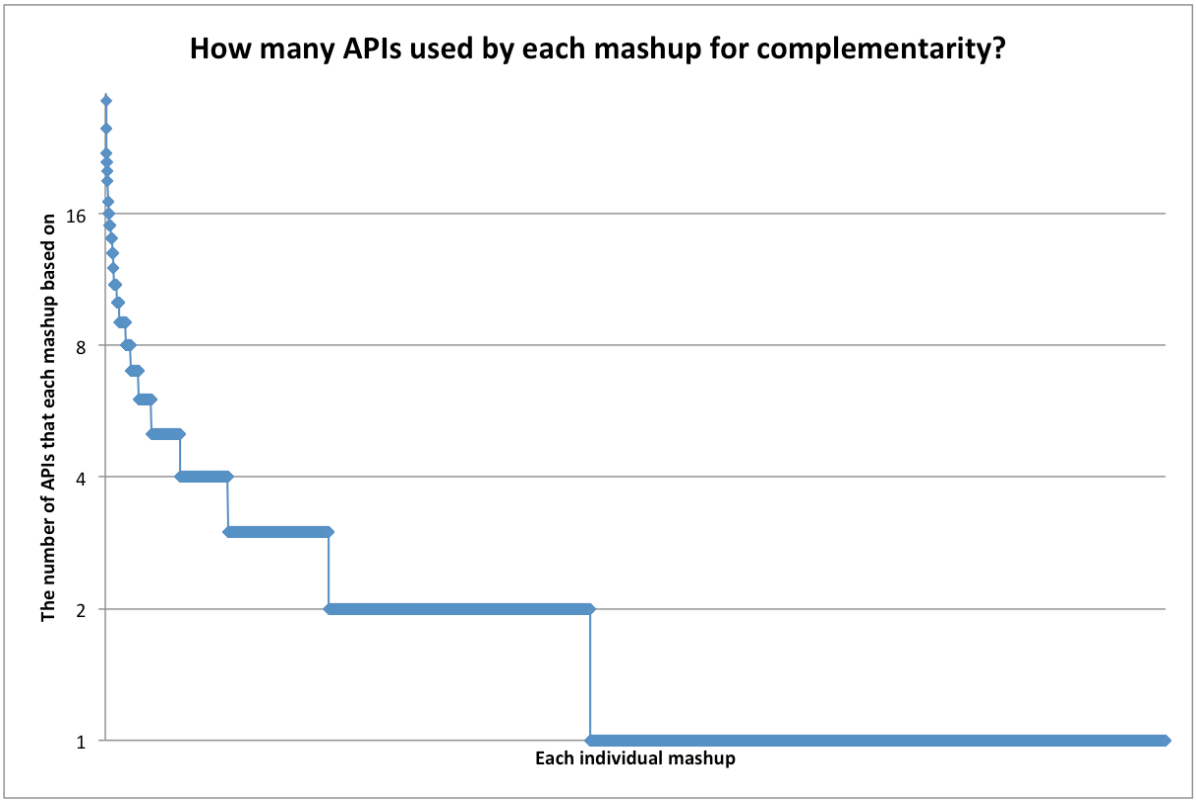

Figure 4: distribution of how many APIs used by each mashup for complementarity. The x-axes shows each individual mashup. The left head shows mashup uses more than one mashups, and the right tail shows mashup uses only one mashups.