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Characterisation of the use of Twitter by Australian universities

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Universities are now observed using social media communications channels for a variety of purposes, including marketing, student recruitment, student support and alumni communication. This paper presents an investigation into the use of the Twitter social media platform by universities in Australia, using publicly available Twitter data over a two year period. A social media network visualisation method is developed to make visible the interactions between a university and its stakeholders in the Twitter environment. This analysis method provides insights into the differing ways Australian universities are active on Twitter, and how universities might more effectively use the platform to achieve their individual objectives for institutional social media communications.

Keywords: social media; higher education; Australia; Twitter

Introduction
Online social media systems have created new ways for individuals to communicate and interact with a wide audience (Swigger, 2012). Likewise for organisations, social media provide new avenues for communication and collaboration with their stakeholders. However, any value created for an organisation through social media comes not from any particular platforms, but from how they are used (Culnan, McHugh & Zubillaga, 2010), and the characteristics of the organisation and the environment in which it operates may impact on the effectiveness of social media as communication tools (Gallaugher & Ransbotham, 2010). Not surprisingly, many organisations are using social media as part of their marketing efforts, as research has shown that consumers are turning away from traditional modes of advertising, and are relying more on social media for information on which to base purchasing decisions, in part due to the perception that it provides more trustworthy information than corporate-sponsored communications (Constantinides & Zinck Stagno, 2011; Mangold & Faulds, 2009). A useful model for conceptualising the management of
customer communication is provided by the 3-M model, which identifies three components of social media communications, all of which need to be effectively managed for best results: i) the Megaphone representing firm-to-customer communication; ii) the Magnet representing customer-to-firm communication; and iii) the Monitor representing customer-to-customer interaction (Gallaugher & Ransbotham, 2010).

While social media may be widely used by individuals and many organisations, their use in higher education is still relatively new (Busch, 2011). Recent investigations into the value of social media for student learning have produced mixed results (Junco, Heiberger & Loken, 2011; Kassens-Noor, 2012). Beyond learning and teaching applications, a range of uses of social media by universities is noted in the literature. In a survey of 148 higher education institutions (primarily from the USA) about their use of social media for marketing, a wide range of tools was reported and it was concluded that, while still viewed by some as controversial, participation in social media is no longer optional (Reuben, 2008). A frequently observed use of social media is student recruitment. A longitudinal survey of 536 higher education admissions offices in the USA found that the use of social media sites increased dramatically between 2007 and 2008, and that more than half of respondents indicated that social media would be ‘very important’ for their future student recruitment (Barnes & Mattson, 2009). There is also evidence that many potential students prefer to interact with university admissions departments via online means (Hayes, Ruschman & Walker, 2009), and use social media to seek out information that is not provided by traditional forms of communication from universities (Constantinides & Zinck Stagno, 2011). In addition to prospective students, a university’s alumni are also likely to be active in social media, and these
important communication channels provide a new way to connect with them and foster a relationship (Kowalik, 2011). While there are privacy issues to be considered, social media offer new ways for student support services to interact with students (Berg, Berquam & Christoph, 2007; Cluett & Skene, 2010). For university libraries, social media offer new channels through which one can have conversations and create relationships, with patrons, but a social media presence requires a commitment (Burkhardt, 2010). For educational (and other non-profit) institutions, simply having a social media presence will not automatically lead to stakeholder participation (Waters, Burnett, Lamm & Lucas, 2009). Busch (2011) urges universities to develop a ‘social media ideology’ that looks beyond social media as just marketing, that acknowledges that social media are much more than specific technology platforms or systems, and that actively engages with stakeholders who are seeking information about the university in the social media environment.

Research on the use of social media by higher education institutions is still limited (Constantinides & Zinck Stagno, 2011). University initiatives normally require some form of evaluation of effectiveness, but evaluation of the impact of social media activities is not straightforward (Culnan et al., 2010), as few benchmarks exist and relationships between activity and outcomes are indirect (Busch, 2011). One approach is qualitative investigation based on interviewing a small set of closely associated users (followers/friends) (Cluett & Seah, 2011). However, this approach is time consuming, and while the data obtained may be rich, it inherently captures only a constrained view of the social media network created. Another approach is network visualisation. Network structures are important in many disciplines, and approaches for network visualisation developed in computer science can be applied to social media data sets. The network data inherently created by social media tools represent
the connections between participants as they interact, and can be used to make visible
the previously elusive social processes at play, and to identify strategically important
components and participants in the social network (Smith, Shneiderman, Milic-Frayling,

One of the most widely-used social media tools employed by organisations is
Twitter (twitter.com) (Culnan et al., 2010). Twitter is a popular and rapidly growing
‘microblogging’ service where users can post quick and frequent short messages (up
to 140 characters) called ‘Tweets’, which may contain links to other online material
such as photos and websites, to their ‘Followers’ who have subscribed to their Twitter
account (Kassens-Noor, 2012; Reuben, 2008). Tweets can be tagged with a searchable
‘hashtag’ (e.g., a conference might publicise a hashtag to use so that Tweets
associated with the event can be easily collected via a tag search), and a user can
‘Retweet’ to all of their Followers a Tweet that they receive from another user
(Gallaugher & Ransbotham, 2010). Tweets can be directed specifically to other
named user accounts, or broadcast generally to all Followers of the sending account.
Except for the content of Tweets from protected (private) accounts, all Tweets are
effectively broadcast to ‘the world’ and are publicly discoverable via a search. There
is a range of third-party applications that provide additional functionality on top of the
Twitter platform and/or help manage Twitter content. Virtually all universities now
advertise a link to a Twitter account on their Internet home page.

The work presented here is an investigation into the use of the Twitter social
media platform by universities in Australia. It focuses on the ‘official’ Twitter
account of a representative sample of Australian universities, and uses publicly
available Twitter data for analyses and visualisation to characterise the engagement
by Australian universities with one popular social media tool. It is an initial
investigation that provides useful insights, as well as offering a methodology for future work.

**Method**
Six Australian universities were selected essentially at random to include one from each of the five recognised institutional groupings (Group of Eight, Innovative Research Universities, Australian Technology Network, Regional Universities Network and Non-aligned) and one private university. A ruling was obtained from the relevant institutional human research ethics committee that the use of publically accessible historical Twitter records did not require formal ethics approval for research purposes. Using the main Internet home page for each university, the ‘official’ advertised Twitter account for each university was identified, and the number of mouse clicks required to access the account was recorded. Using the NCapture program (QSR International, 2012a), Twitter data from that account in the two year period from 1 December 2010 to 30 November 2012 were captured. The NVIVO program (QSR International, 2012b) was used to convert the captured Twitter data into a Microsoft Excel (Microsoft, 2010) spread sheet. For each university, basic Twitter account statistics as at the time of data collection were compiled and visually assessed via scatterplot. For each university, the spread sheet Twitter data were graphed using Excel to visualise the monthly frequency of Tweets by type (Tweets and Retweets). For each university the spread sheet Twitter data were also exported in comma separated values (CSV) format, and then imported into the Gephi program (The Gephi Consortium, 2012) to visualise the communication network embodied in the data. As outlined in Figure 1, Gephi represents Twitter user accounts as ‘nodes’, and the communication path (representing one or more Tweets) between two nodes as an ‘edge’. In the network diagrams used in this paper, edges are presented as curved
lines, the direction of Tweets is clockwise around the edge, and the width of an edge is proportional to the total number of Tweets recorded between the two nodes.

Figure 1. Twitter network visualisation schema used in this paper.

Results
Table 1 shows the number of mouse clicks from the university Internet home page required to access the institutional Twitter account, and a range of basic account statistics as at the time of data collection.

Table 1. Number of mouse clicks from university Internet home page required to access institutional Twitter account, and basic account statistics.

<table>
<thead>
<tr>
<th>University</th>
<th>No. of clicks</th>
<th>Tweets (directed/undirected)</th>
<th>Retweets</th>
<th>Followers</th>
<th>Following</th>
</tr>
</thead>
<tbody>
<tr>
<td>University 1</td>
<td>1</td>
<td>2421 (1680/741)</td>
<td>715</td>
<td>17129</td>
<td>729</td>
</tr>
<tr>
<td>University 2</td>
<td>2</td>
<td>563 (247/316)</td>
<td>90</td>
<td>4505</td>
<td>523</td>
</tr>
<tr>
<td>University 3</td>
<td>1</td>
<td>320 (211/109)</td>
<td>138</td>
<td>2701</td>
<td>2223</td>
</tr>
<tr>
<td>University 4</td>
<td>2</td>
<td>493 (21/472)</td>
<td>15</td>
<td>600</td>
<td>528</td>
</tr>
<tr>
<td>University 5</td>
<td>1</td>
<td>397 (38/359)</td>
<td>23</td>
<td>2604</td>
<td>959</td>
</tr>
<tr>
<td>University 6</td>
<td>3</td>
<td>1016 (432/584)</td>
<td>194</td>
<td>3843</td>
<td>247</td>
</tr>
</tbody>
</table>

All pairs of data categories in Table 1 were visualised as scatterplots, and three suggestive linear associations were observed, and these are presented in Figure 2 – a) Tweets versus Retweets; b) Tweets versus Followers; and c) Retweets versus
Followers). However, the data for University 1 manifests as a significant outlier, and being based on six observations only, these results are treated as indicative rather than definitive.

Figure 2. Scatterplots of number of Tweets, Retweets and Followers.

Figure 3 shows the number of Tweets, number of Retweets and (via the stacked columns) the total number of Tweets originating from the Twitter account for University 1 for each month during the period under consideration. Figure 4 presents a network visualisation of all of the Tweets and Retweets from the Twitter account for University 1 for the entire period under consideration, based on the schema presented in Figure 1 and with width of network edges proportional to the number of Tweets between pairs of nodes. All nodes (Twitter accounts) have been de-identified, with the node for University 1 positioned in the centre of the network diagram, and the large edge directed toward the top of the network diagram representing undirected Tweets from University 1 sent to their Followers, and ‘the world’ at large. Apart from the nodes representing University 1 and ‘the world’, all other nodes are located essentially at random, as produced by the Gephi visualisation program. Figures 5 and 6 present the same results for the data from the Twitter account for University 2. Figures 7 and 8 present the same results for the data from the Twitter account for University 7. Column charts were not produced separately for Universities 3, 4 and 6,
as they were structurally similar to that given for University 2 in Figure 5. Network diagrams were not produced separately for Universities 3, 4 and 6, as they were structurally similar to that given for University 2 in Figure 6 (Universities 3 and 6), and to that given for University 5 in Figure 8 (University 4).

Figure 3. Monthly frequency of Tweets, Retweets and total Tweets for University 1.
Figure 4. Twitter network diagram for University 1.

Figure 5. Monthly frequency of Tweets, Retweets and total Tweets for University 2.
Figure 6. Twitter network diagram for University 2.

Figure 7. Monthly frequency of Tweets, Retweets and total Tweets for University 5.
Discussion
As noted previously, the value for an organisation that is derived from a social media presence comes not from the social media systems themselves, but how they are used to interact with stakeholders (Culnan et al., 2010), and simply having a presence does not guarantee stakeholder participation (Waters et al., 2009). A foundation principle in attracting users is a prominent link to the organisation’s social media accounts on the organisation’s main Internet home page (Burkhardt, 2010; Constantinides & Zinck Stagno, 2011; Culnan et al., 2010). As recorded in Table 1, while all six universities provided some form of link to their Twitter account on their home page, in half the cases this was an indirect link that required further navigation to access the institutional Twitter account, possibly loosing potential new Followers along the way.
Use of social media by organisational stakeholders is voluntary, so it is important for an organisation to attract a critical mass of members (Followers) and facilitate their active participation in an online community (Culnan et al., 2010). Table 1 shows a wide variation in the number of Followers for the six universities studied, and Figure 2 provides some evidence of a link between the level of activity of an institutional Twitter account (number of Tweets and Retweets) and the number of Followers. It is not surprising that number of Tweets and Retweets were found to be correlated, given that these are related activities. Retweeting may be important for attracting Followers, as this process is an interaction with the social media content created by another user, and this interaction is flagged back to the originator, so may lead to a Follower relationship where one does not already exist.

Virtually all social media researchers note the importance of a sustained commitment to the use of social media, if that use is to be most effective. The commitment is required in all three components of the 3-M model of social media communications – in the creation of appropriate social media content; in the active response to directed communications from stakeholders; and in the vigilant monitoring of the wider social media environment for communications between third-parties that might impact on the organisation. Figure 3 indicates a regular, sustained and relatively high level of both Tweets and Retweets from the account of University 1, and a correspondingly ‘busy’ network diagram is seen in Figure 4. Figure 5 indicates a regular and sustained, but comparatively low level of both Tweets and Retweets from the account of University 2, and a correspondingly ‘modest’ network diagram is seen in Figure 6. Figure 7 indicates a highly irregular level of activity from the account of University 5, with very few Retweets and a correspondingly ‘sparse’ network diagram is seen in Figure 8.
A limitation of the data collected here is that it only includes messages originating from the university Twitter account under consideration, and does not directly include any messages from other accounts that are directed to, or mention, the university Twitter account under consideration. This limitation arises from function of the Twitter application itself – for a specific account, a significant archive of historical Tweets can be accessed, but a general search for Tweets mentioning a specific account produces much more limited results, typically Tweets for the most recent few days only. Systematic collection of Tweets mentioning a specific account requires regular data collection across the time period of interest. However, a proportion of Retweets sent from an account will arise from Tweets originating elsewhere, but directed to that account or otherwise mentioning that account in some way. The NCapture program used here records such Retweets as if they originated elsewhere, so some measure of the online community and social media interactions related to the university Twitter account under consideration is captured and visualised in the network diagrams presented here.

In terms of the 3-M model of social media communications (Gallaugher & Ransbotham, 2010), all of the network diagrams presented here show evidence of the ‘Megaphone’. All three contain a large edge representing Tweets emanating from the university account in the centre of the diagram, rising vertically to the top of the diagram and directed to their Followers, and the world at large. In addition, there are varying numbers of edges emanating out from the university account in a clockwise direction to specific nodes, which represent Tweets directed to specific user accounts. Collectively, these two classes of Megaphone edges emanating clockwise from the university account represent the Tweets identified in Table 1 for each university. To varying degrees, all three network diagrams show evidence of the ‘Magnet’. Edges
from nodes that connect into the university account at the centre in a clockwise
direction represent Tweets from user accounts directed to the university account. The
least represented element of the 3-M model is the ‘Monitor’. The small balance of
edges in the network diagrams presented are those that link node pairs not including
the university account in the centre of the diagram. These edges represent those
Tweets between two accounts that mention the university, or those Tweets of
relevance/interest to the university account, such that the university account has seen
fit to Retweet them. Collectively, the Magnet and Monitor edges represent the
Retweets identified in Table 1 for each university.

Again, acknowledging the incomplete representation of the social media
environment presented in the network diagrams for each university, some distinct
differences in the forms of social media interactions can be observed. In Figure 8,
university 5 appears to be largely ‘Megaphoning’, with undirected Tweets
outnumbering directed Tweets 9.5 to 1, and a ratio of Tweets to Retweets of more
than 17 to 1. Contrast this to university 1 (Figure 4) where, even though University 1
sends many times the number of Tweets as University 5, the ratio of undirected to
directed Tweets is 0.44 to 1 (i.e., the majority of Tweets are to named accounts rather
than to ‘the world’), and the ratio of Tweets to Retweets is only 3.4 to 1. University 5
is in a largely one-way conversation, ‘shouting’ at the world, while university 1 is
engaged in a complex conversation with the stakeholders in its social media
environment. In Figure 6, a number of ‘closed loops’ can be observed, where a pair of
edges between the central node for the account of University 2 and the node of
another user account form a loop. Such loops represent a conversation between the
University 2 account and the other user – a particularly prominent example of which
can be observed between the central university node and another located towards the mid-top-right of Figure 6.

An even more complex Twitter communication interaction can be seen in Figure 4. Note the presence of a node/user to the right of Figure 4 that has a strong association with the central account of University 1 – as evidenced by the wide horizontal edge between them. This second prominent node happens to be the ‘media’ Twitter account for University 1, and it Retweets (re-broadcasts) many of the Tweets from, or from other accounts that mention, University 1. This media account also exhibits a significant relationship with another node located towards the mid-top-right of Figure 4. This third prominent node happens to be the Twitter account for a popular Australian online academic news website with a large number of Followers (18674 at the time of this study). This academic news account receives a large number of Tweets from the media account of University 1, and, as evidenced by the wide edge from that third node back to the account for University 1, is broadcasting a significant number of Tweets mentioning University 1. This complex interaction creates significant additional publicity for University 1, effectively amplifying the social media reach of Tweets about University 1 by leveraging off the Follower-base of the academic news account. The value created by purposeful linking of social media accounts and the development of processes to benefit from ‘content’ created by other social media users is described in the literature (Culnan et al., 2010; Gallaugher & Ransbotham, 2010).

Word of mouth is traditionally the most persuasive form of promotion (Gallaugher & Ransbotham, 2010) and social media can amplify the impact (both positive and negative) of the conversation about an organisation between stakeholders (Constantinides & Zinck Stagno, 2011; Mangold & Faulds, 2009). Many prospective
students are using social media to gather information about universities, so universities do need to engage in this online environment (Busch, 2011). A passive or unsophisticated presence in social media is unlikely to be effective (Constantinides & Zinck Stagno, 2011) – consider the contrasting approaches for University 1 and University 5 observed here. Social media conversations about, and that can influence, organisations are occurring continually, whether the organisation is ‘listening’ or not (Kowalik, 2011). It is increasingly important for organisations to be active participants in social media, and to monitor and manage the communication that concerns them (Gallaugher & Ransbotham, 2010; Hayes et al., 2009). This requires learning the ‘rules of engagement’ of (Barnes & Mattson, 2009), and making a commitment to (Burkhardt, 2010), social media participation.

The investigation presented here is necessarily limited in that it includes only six Australian universities. As previously noted, this investigation did not capture all Twitter-related activity for the six universities examined, as it was not possible to retrospectively collect all data relating to Tweets mentioning the universities. These ‘word of mouth’ social media interactions that occur between third party stakeholders about an organisation are vitally important to that organisation. A more comprehensive future investigation would include a timeframe that permits the systematic collection of Tweets mentioning the universities. As observed in the analysis of Figure 4, a university may operate more than one Twitter account. In fact, it is common for universities to operate multiple Twitter accounts for specific purposes; hence the focus here on the single ‘official’ university Twitter account may not capture the full complexity of the universities’ Twitter communications. Additionally, by focussing on the Twitter platform only, this investigation only includes one aspect of the total social media environment. For the six universities...
included here, along with links to Twitter, their Internet home pages also advertised links to a range of other social media platforms, including: Facebook (all six); YouTube (four); a university blog (two); Flickr (two); LinkedIn (one); iTunesU (one); and while not strictly a social media platform, two universities also provided a link to a RSS news feed. The numbers recorded in Table 1 and the various visualisations presented in the Figures do not indicate the purpose and content of the Twitter communications that they summarise. The main ‘official’ university Twitter account is likely to have a role in general brand awareness/development, news communication and being a first point of contact for a wide range of stakeholders seeking answers to questions via a social media channel, and hence be relatively complex to manage. It would be possible to perform textual analysis on the contents of the Tweets relating to an account. For example, the 3136 Tweets and Retweets recorded from the account of University 1 contain more than 50,000 words and, although beyond the scope of this investigation, content analysis would provide more insight about the purpose and nature of the social media conversations undertaken by the university.

Conclusion
Online social media systems have created new ways for individuals and organisations to communicate and interact with a wide audience. Social media use by higher education institutions is still relatively new. A range of uses of social media in higher education is observed, including: learning and teaching, general marketing, student recruitment, alumni communication, student services, libraries, and others. Evaluation of the effectiveness of social media activities can take a number of forms, including network analysis that visualises the connections and interactions between participants. One of the most popular social media platforms is Twitter. This paper presents an investigation into the use of Twitter by universities in Australia, using publicly
available Twitter data from the ‘official’ university account over a two year period for analyses and visualisation, to characterise the engagement by Australian universities with one popular social media tool. Widely varying levels of activity were observed; with the most active account having a sustained profile of posting, generating 7.5 times as many Tweets as the least active. Achieving most social media objectives requires a critical mass of Followers. A tentative association was observed between level of Retweets and number of Followers. Retweeting is an interaction with another user, and may promote Following in return. The network visualisations produced provide insights into the differing ways Australian universities are active on Twitter. In one case, largely undirected ‘Megaphone’ Tweeting was observed. In another case, high levels of Retweeting and complex interactions with multiple related and external accounts were observed. The value for an organisation that is derived from a social media presence comes not from the social media systems themselves, but how they are used to interact with stakeholders. The second case demonstrates the ability of a user to leverage off external accounts and to amplify the reach and impact of their Twitter messages. Covering only six Australian universities, only the Twitter social media platform, and not being able to systematically track Twitter mentions of the target universities, this investigation is necessarily limited in scope. However, the work documented provides useful insights into the different ways that Australian universities are using Twitter, how they might more effectively use the platform to achieve their individual objectives for institutional social media communications, and offers a methodology that can be used for future research.
References


