An Attempt to Study the Hierarchy of Inter-relations amongst the Social Media Metrics behind Successful Execution of Physiotherapy and Wellness Centres

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ABSTRACT
Present research contributes towards exploring and thereafter establishing inter-relationships amongst the social media metrics that are helpful in success of Physiotherapy health care practitioners as well as for physiotherapy clinics. Thereafter it tries to establish the inter-relationship amongst them using ISM methodology.

Keywords
Physiotherapy; Social media metrics; Health care metrics; Interpretive Structural Modelling Methodology; Social media

1. INTRODUCTION
Indian government is striving hard to provide world class and affordable health services to its citizens. Data figures marked a steep increase in health expenditure which is approximately 370% between year 2010-2014. To provide better health care facilities for their citizens, policymakers are looking for methods to measure and benchmark the performance of their health care systems as a precondition for evidence-based health policy reforms.

Health 2.0 in Web 2.0 is a popularized term marking presence of health information [1]. As consumers, individuals have been attracted to, retained and engaged in the commercial landscape using social media. Successful incorporating social media into the way physical therapists both design and deliver care holds potential for engaging patients in prescribed health behaviors. Social media have been described by physical therapists as a simple medium to reach individuals, answer questions, and educate. Physical Therapy 2.0 [2] is the use of Web 2.0 tools and platforms by physical therapists, utilizing principles of user-generated content and collaboration among networks and individuals to personalize health care. There are five classifications of social media as prescribed by Knight et al. [2] which includes blogs, You tube and Flickr, social networking sites such as Facebook, Twitter etc. as well as virtual worlds such as Second Life, World of Warcraft etc. Other social sites in the top 10 include collaborative sites (e.g. Wikipedia) and consumer-review sites (e.g. Amazon), with various social networking and blog sites (e.g. Twitter, Blogspot.com, LinkedIn) rounding out to top 15.

Despite the magnanimous contribution of social media such as You tube in many industries, its utility in health care is quite recent. There are reports available which describes the social content related to specific conditions and disease states such as concussion, obesity or health promotion practices such as smoking and drinking behaviour of consumers and their relations with physical activity etc. Another horizon is of chronic conditions and non-communicable diseases which presents a substantial opportunity for engaging patients in health promotion and disease management in years to come.

Knight et al. [3] proposed that leveraging the power and utility of social media, could innovate the way physical therapists engage patients in rehabilitation and health promotion practices. The American Physical Therapy Association has published standards of conduct for the use of social media by members [4]. While implementing social media among regulated health professions, unique, challenges also exist. Some of the prime challenges being the readiness of clinicians to adopt social media practices in the process of delivering routine care may vary among health care professions. Though in a recent publication from the Canadian Physical Therapy Association [5] highlights examples of clinicians who are actively engaged in social media to augment their existing practices which shows a positive trend towards the use of social media in health care. In addition, the funding model to support the time clinicians are engaged in social media remains to be established.

The article is written as follows: Section 2 describes the literature review. Section 3 presents the ISM Methodology. Section 4 presents the case example and section 5 the managerial implications.

2. LITERATURE REVIEW ON MEASURING THE EFFECT OF SOCIAL MEDIA
2.1 Classification of social media
As previously mentioned, social media can be classified into five categories or platforms viz. Blogs, Content communities, collaborative projects, social networking sites and virtual worlds each of which has been described as follows:

Blogs: Blogs can be used by individual clinicians or groups of practitioners as well as patients to share their experiences and evidences for care delivery etc. However, a serious challenge with this platform is the maintenance and regular updation.

Content communities: This includes platforms such as YouTube and Flickr etc. Posted content may be used to help patients remember proper execution of prescribed health behavior post clinic care as well as an education tool for sharing evidence-informed practices with patients and fellow practitioners.

Collaborative projects or wikis: In addition to profession-specific wikis such as Wikipedia, clinicians, researchers, and professional associations can contribute towards more general wikis by sharing their experiences thereby enhancing the profession's online credibility and brand identity by posting evidence-based information.

Social networking sites such as Facebook and Twitter:
Social networking sites such as Facebook, Twitter etc. can be used by clinicians, researchers etc. to update patients and practitioners by sharing administrative related announcements such as hours of operation, equipment, services provided as well as practice updates such as treatment guidelines, emerging evidence.

Virtual worlds: This platform requires the establishment of a virtual environment and persona (e.g., avatar). An example could be augmenting patients’ visualization of their engagement in a prescribed behaviour by allowing them to virtually execute it.

2.2 Evaluation of Performance: Metrics [6-21]

In physical therapy, metrics need to be representative of a clinician's patient population. These metrics inherently exist among individual social media platforms, which could be tracked and reported, text, and viewer’s comments in the form of video titles, tags. Previous research analysing condition-specific content on YouTube has used metrics such as top five tags, number of views and months since the video was uploaded. Another metric worth considering could be amount-specific content e.g., a clinician's blog about a specific treatment approach which was reposted or shared on another social media platform. Some of the common metrics considered by health care businesses are (1) social patient relationship management, (2) referred social traffic, (3) social impressions and (4) social treatment outcomes as part of health metrics. All these metrics have been described as follows:

2.2.1 Common metrics (CoM): Some of the common metrics considered by health care businesses are top five tags, number of views and the months since the last video was uploaded.

2.2.2 Social patient relationship management (SPRM): This metric would provide insight into the value being created for patients. This could be achieved by tracking the size of the population that is enrolled in regular interaction with their care provider through social media platforms over time.

2.2.3 Referred social traffic (RST): This metric provides information about reach of involved use on social media. Mathematically, this information could be collected by tracking the number of users who accessed a site from a referring social media site e.g., blogs, social networking, content communities and also using existing analytic tools e.g., Google Analytics.

2.2.4 Social impressions (Sim): This metric would help to provide information about the pervasive spread of a user's social presence over a specified time period. Alert tools will help track reference to the user-generated content e.g., clinician’s Twitter feed.

2.2.5 Social treatment outcomes (STO): This metric would help in determining whether social media engagement leads to improved treatment outcomes, which could be achieved by reporting the relationship between a patient's treatment outcomes and his or her engagement in care delivery.

Similarly, there are metrics to measure the digital success of the Physiotherapy Business.

2.2.6 Website Traffic (WeT): Whether your digital marketing strategy involves getting people to your website to acquire or promote your services, building an email list or promoting a series on your blog, the point is to get people on your website. Therefore, website traffic is an important metric for measuring the success of digital campaigns.

2.2.7 Source of Traffic (SoT): Another useful metric is understanding the source of website traffic. As per Google Analytics, four different sources of traffic have been recognised viz., organic search, direct, referrals, and social. An organic search means that someone searched a keyword on Google and clicked on your link after it came up in their search results. Direct visitors are those who typed in your website address or it might mean they have your page bookmarked so they can head straight there when in need. Referrals are the users that were sent to your website by clicking a link from another website and Social visitors are the users who came from social media channels and straight to your website.

2.2.8 New Visitors/Returning Visitors Ratio (NV/RV): As per the requirement of Physio business NV/RV ratio differs. For example, for startup physio business, taking a look at how many new visitors the website attracts will be beneficial. On the other hand, if there is an interest of how much trust people have for the brand or liking of blog posts, then understanding the number for return visitors will be essential.

2.2.9 Session Duration (SD): Session duration is another important metric after knowing the number of active sessions or sessions received by the website. The idea is that the longer someone stays on a certain webpage, the more that website is deemed to be relevant and interesting.

2.2.10 Most Visited Pages (MVP): Most visited pages are valuable to know because if some ten pages are managed by the website manager, half of the work is got done by focusing your efforts on the pages that are measurably gaining traction.

2.2.11 Bounce Rate (BR): There’s also a term called exit rate exists that notes the users who left your website after viewing multiple pages and is a good indicator of where people might be losing interest. High bounce rate or exit rate or broken links are important in this regard.

2.2.12 Conversion Rate (CR): Your conversion rate is the rate of users who complete a call-to-action. Whether that's asking visitors to join your mailing list, schedule an appointment, leave a comment, or complete an appointment your conversion rate is a fantastic metric that you should definitely be monitoring on a weekly basis and reported on a monthly basis.

2.2.13 Impressions and Reach (I&R): Impressions on social media are similar to visitor sessions on a website. It counts the number of people who saw your post, including when the same person saw it multiple times. Reach is the actual number of users who saw your content. For that reason, your social media reach will always be lower than your number of impressions.

2.2.14 Engagement (En): Engagement includes clicks, shares, likes, retweets, comments, reposts, etc. The goal is to engage 2-5% of the overall reach and to do so, it is required to include call-to-actions, similar to what you’d do on your website when you’re aiming for more conversions.

2.2.15 Keyword Rankings (KR): When working on individual digital marketing campaigns, keyword rankings become important. More specifically, the phrases making a remarkable differences on the website can be further explored. There are useful paid and free keyword ranking tools that you can access and track to see where your physio’s business is ranking.
2.2.16 External Links (EL) : The more links that are directed to your website, high are chances that the website will show up in the Google search results.

2.2.17 Click Through Rate (CTR) : This metric comes into play when you do more paid advertising in your digital spaces. Blogs are a great way to get traffic to your site. Blogs’ high bounce and exit rates could be used to set goals for driving traffic from the blog to the main site. A small increase in blog click-throughs can provide valuable new business at almost no additional marketing costs.

2.2.18 Return on Investment (ROI) through average life time value : ROI of the marketing efforts is easy to understand with a good idea about the average customer spending over their life time.

3. INTERPRETIVE STRUCTURAL MODELLING METHODOLOGY [ISM ]
Interpretive Structural Modeling methodology a.k.a ISM [21] is a known technique to map the relationships amongst the relevant elements as per decision maker’s problems in a hierarchical manner. It begins with a series of events starting from the identification of elements, it moves to establishing the contextual relationships between elements through pairwise examination and then further moving on towards developing the structural self-interaction (SSIM) matrix using VAXO [21] and then initial reachability matrix and final reachability matrix and rearranging the elements in topological order using the level partition matrices. Finally, a diagram can be obtained.

4. DEVELOPMENT OF ISM MODEL: CASE EXAMPLE
Based on the exploratory research, around 18 metrics have been identified viz. Common / basic metrics (CoM) ; Social patient relationship management (SPRM) ; Referred social traffic (RST) ; Social impressions (SIm) ; Social treatment outcomes (STO) ; Website Traffic (WeT) ; Source of Traffic (SoT) ; New Visitors/Returning Visitors Ratio (NV/RV); Session Duration (SD); Most Visited Pages (MVP) ; Bounce Rate (BR); Conversion Rate (CR) ; Impressions and Reach (I&R) ; Engagement (En) ; Keyword Rankings (KR) ; External Links (EL) ; Click Through Rate (CTR) and Return on Investment (ROI). These metrics are now been studied or the possible interrelationships using ISM methodology in this section.

Explanation : RST lead to STO and STO leads to SIM. Source of traffic affects STO. Website traffic affect social traffic and vice versa. Session duration affects the NV/RV. Most visited pages will affect the NV/RV. Session duration also affects bounce rate, most visited pages, keyword rankings and click through rate. External links LS affects CTR and ROI. Engagement with website affects the keyword Rankings and also click through rate. Keyword ranking affects return on investment. More the engagement less should be the bounce rate. Most visited pages affect click through rate and click through rate affect most visited pages.

4.1 Construction of Structural self-interaction Matrix (SSIM)
This matrix gives the pair-wise relationship between two variables i.e. $i$ and $j$ based on VAXO. SSIM has been presented below in Fig 1.

4.2 Construction of Initial Reachability Matrix and final reachability matrix
The SSIM has been converted in to a binary matrix called the Initial Reachability Matrix shown in fig. 2 by substituting $V$, $A$, $X$, $O$ by 1 or 0 as per the case. After incorporating the transitivity, the final reachability matrix is shown below in the Fig 3.

| S. No | Barrier | CoM | SPRM | RS | SI | ST | WeT | SoT | NV/RV | S | MV | BR | C | I&R | E | K | E | CT | CR | ROI |
|------|--------|-----|------|----|----|----|-----|-----|--------|---|----|----|--|----|--|--|--|----|----|----|
| 1    | CoM    | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 2    | SPRM   | A   | A    | A   | A  | A  | A   | A   | A      | A | A  | A  | A | A  | A | A | A | A  | A  | A  |
| 3    | RST    | A   | V    | X   | A  | V  | A   | A   | A      | A | A  | A  | A | A  | A | A | A | A  | A  | A  |
| 4    | SIM    | A   | X    | A   | A  | A  | A   | A   | A      | A | A  | A  | A | A  | A | A | A | A  | A  | A  |
| 5    | STO    | A   | A    | A   | A  | A  | A   | A   | A      | A | A  | A  | A | A  | A | A | A | A  | A  | A  |
| 6    | WeT    | A   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 7    | SoT    | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 8    | NV/RV  | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 9    | SD     | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 10   | MVP    | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 11   | BR     | O   | A    | V   | O  | A  | A   | A   | A      | A | A  | A  | A | A  | A | A | A | A  | A  | A  |
| 12   | CR     | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 13   | I&R    | A   | A    | A   | A  | A  | A   | A   | A      | A | A  | A  | A | A  | A | A | A | A  | A  | A  |
| 14   | En     | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 15   | KR     | A   | A    | A   | A  | A  | A   | A   | A      | A | A  | A  | A | A  | A | A | A | A  | A  | A  |
| 16   | EL     | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 17   | CTR    | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |
| 18   | ROI    | V   | V    | V   | V  | V  | V   | V   | V      | V | V  | V  | V | V  | V | V | V | V  | V  | V  |

Fig 1: SSIM matrix for pair wise relationship amongst barriers
The elements for which the reachability and intersection sets are same are the top-level element in the ISM hierarchy. After the identification of top level element, it is separated out from the other elements and the process continues for next level of elements. Reachability set, antecedent set, intersection set along with different level for elements have been shown below in table 1 to table 11.

**4.3 Level Partition**

From the final reachability matrix, reachability and final antecedent set for each factor are found. The elements for which the reachability and intersection sets are same are the top-level element in the ISM hierarchy.
### Table 1: Iteration I

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|--------|------------------|----------------|------------------|-------|
| 1      | 18               | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18 | 18    |       |
| 2      | 2,3,4,5,6,18     | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 | 2,3,4,5,6 |       |
| 3      | 2,3,4,5,6,8,18   | 1,2,3,4,6,7,8,9,10,11,12,13,14,15,16,17 | 2,3,4,6,8 |       |
| 4      | 2,3,4,5,6,8,13,15,18 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,13,15,18 | 1 |
| 5      | 2,3,4,5,6,18     | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 | 2,3,4,5,6 |       |
| 6      | 2,3,4,5,8,11,13,17,18 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,11,13,17,18 | 1 |
| 7      | 2,3,4,5,6,8,12,13,15,17,18 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,12,13,15,17,18 | 1 |
| 8      | 2,3,4,5,6,8,13,15 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,13,15 | 1 |
| 9      | 2,3,4,5,6,8,14,16,17 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,14,16,17 | 1 |
| 10     | 2,3,4,5,6,8,15,17 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,15,17 | 1 |
| 11     | 2,3,4,5,6,8,9,10,11,12,13,14,15,16,17 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,9,10,11,12,13,14,15,16,17 | 1 |
| 12     | 2,3,4,5,6,7,9,10,11,12,13,14,15,16,17 | 1,2,3,4,6,7,9,10,12,13,14,15,16,17 | 2,3,4,6,7,9 | 1 |
| 13     | 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 | 1,2,3,4,6,7,8,9,10,12,13,14,15,16,17 | 2,3,4,6,7,8,9 | 1 |
| 14     | 2,3,4,5,6,7,9,10,11,12,13,14,15,16,17 | 1,2,3,4,6,7,8,9,10,12,13,14,15,16,17 | 2,3,4,6,7,9 | 1 |
| 15     | 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 | 1,2,3,4,6,7,8,9,10,12,13,14,15,16,17 | 2,3,4,6,7,8 | 1 |

### Table 2: Iteration II

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|--------|------------------|----------------|------------------|-------|
| 2      | 2,3,4,5,6        | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 | 2,3,4,5,6 |       |
| 3      | 2,3,4,5,6,8      | 1,2,3,4,6,7,8,9,10,11,12,13,14,15,16,17 | 2,3,4,6,8 |       |

### Table 3: Iteration III

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|--------|------------------|----------------|------------------|-------|
| 3      | 8                | 1,7,8,9,10,11,12,13,14,15,16,17 | 8 |    |
| 4      | 8,13,15          | 1,7,9,10,11,12,13,14,15,16,17 | 13,15 |    |
| 7      | 8,11,13,15       | 1,7,9,10,11,12,13,14,15,16,17 | 11 |    |
| 8      | 8,12,13          | 1,7,9,10,11,12,13,14,15,16,17 | 12 |    |
| 9      | 8,11,13,14,15,17 | 1,7,9,10,11,12,13,14,15,16,17 | 10,13,17 |    |
| 10     | 8,10,11,12,13,14,15,17 | 1,7,9,10,14,16,17 | 10,17 |    |
| 11     | 8,10,11,12,13,15,16,17 | 1,7,9,10,14,16,17,18 | 16 |    |
| 12     | 8,10,11,12,13,14,15,16,17 | 1,7,9,10,14,16,17,18 | 14 |    |
| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|-------|------------------|----------------|------------------|-------|
| 4.    | 13,15            | 1,7,9,10,11,1,7,9,10,11,14,15,16,17 | 13,15 | IV |
| 7.    | 11,13,15         | 1,7,9,10,11,1,7,9,10,14,15,16,17 | 11    | |
| 8.    | 12,13,15         | 1,7,9,10,11,1,7,9,10,13,14,16,17 | 12    | |
| 9.    | 11,12,13,15,17   | 1,7,9,10,13,1,7,9,10,14,16,17 | 10,13,17 ||
| 10.   | 10,11,12,13,15,1,7 | 1,7,9,10,14,1,7,9,10,14,16,17 | 10,17 | |
| 11.   | 10,11,12,13,15,1,7 | 1,7,9,10,14,1,7,9,10,14,16,17 | 16    | |
| 12.   | 10,11,12,13,14,1,7 | 1,7,9,10,14,1,7,9,10,14,16,17 | 14    | |
| 13.   | 9,10,11,12,13,1,7 | 1,7,9,10,14,1,7,9,10,14,16,17 | 10,17 | |
| 14.   | 7,9,10,11,12,13,1,7 | 1,7,9,10,14,1,7,9,10,14,16,17 | 17    | |
| 15.   | 1,7,9,10,11,12,13,1,7 | 1,7,9,10,14,1,7,9,10,14,16,17 | 1     | |

Table 4: Iteration IV

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|-------|------------------|----------------|------------------|-------|
| 9.    | 17               | 1,7,9,10,14,1,7 | 16,17 | VI |
| 10.   | 10,17            | 1,7,9,10,14,1,7 | 16,17 | |
| 11.   | 10,16,17         | 1,7,9,14,1,7,9 | 16    | |
| 12.   | 10,14,16,17      | 1,7,9,14,1,7,9 | 14    | |
| 13.   | 9,10,14,16,17    | 1,7,9,14,1,7,9 | 9     | |
| 14.   | 7,9,10,14,16,17,1,7 | 1,7,9,14,1,7,9 | 7     | |
| 15.   | 1,7,9,10,14,16,17,1,7 | 1,7,9,14,1,7,9 | 1     | |

Table 6: Iteration VI

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|-------|------------------|----------------|------------------|-------|
| 11.   | 16               | 1,7,9,14,1,7,9 | 16    | VII |
| 12.   | 14,16            | 1,7,9,14,1,7,9 | 14    | |
| 13.   | 9,14,16          | 1,7,9,14,1,7,9 | 9     | |
| 14.   | 7,9,14,16,18     | 1,7,9,14,1,7,9 | 7     | |
| 15.   | 1,7,9,14,16,17,1,7 | 1,7,9,14,1,7,9 | 1     | |

Table 7: Iteration VII

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|-------|------------------|----------------|------------------|-------|
| 12.   | 14               | 1,7,9,14,1,7,9 | 14    | VIII |
| 13.   | 9,14             | 1,7,9,14,1,7,9 | 9     | |
| 14.   | 7,9              | 1,7,9,14,1,7,9 | 7     | |

Table 8: Iteration VIII

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|-------|------------------|----------------|------------------|-------|
| 13.   | 9                | 1,7,9,14,1,7,9 | 9     | IX |
| 14.   | 7,9              | 1,7,9,14,1,7,9 | 7     | |
| 15.   | 1,7,9            | 1,7,9,14,1,7,9 | 1     | |

Table 9: Iteration IX

| S. No. | Reachability set | Antecedent set | Intersection set | Level |
|-------|------------------|----------------|------------------|-------|
| 14.   | 7                | 1,7,9,14,1,7,9 | 7     | X |

Table 10: Iteration X
4.4 Classification of factors

The critical success factors described earlier are classified into four clusters viz. autonomous factor, dependent factors, linkage factors and independent / Driving factors are mentioned below.

![Diagram](image_url)

**Fig. 4. Driving Power and Dependence Diagram**

5. OBSERVATIONS & CONCLUSIONS

- Lack of regulation may limit a health care professional's willingness to engage in the social media dialogue.
- The engagement of physical therapists in the Health 2.0 landscape helps in contributing towards building the brand identity of the profession by creating and maintaining a social voice and contributing towards the development and sharing of credible and evidence-based health information across this platform.
- 80% of Indian digital marketing traffic comes from the mobile devices, so in-app marketing and push notifications should be an essential part of any digital marketing strategy.
- Multi-channel digital marketing is becoming popular and it has become an inherent requirement for the managers to follow their customers across all different channels and provide a consistent experience across every one of them.
- Each platform has its own ready-made analytics tool such as Search Console for Google and Facebook Insights for Facebook, as well as iTunes Connect for the AppStore.

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