

## Executive summary

We propose new metrics to capture the combination of creativity and knowledge sharing unique capabilities of human beings as a proxy of Human Potential development. First, we identify and define “creative sharing” as an important and differentiating element of human societies. Second, we review existing metrics and analysis tools related to either creativity or knowledge sharing evaluation, most of which are still in their infancy, and we then derive our own original “creative sharing” measurement model to overcome the state of the art limitations.

Our ideation proposal builds upon a variety of recent research work from a diversity of fields ranging from social sciences to web analytics through scientometrics, and calls for the setup of a transversal worldwide expert team to further experiment and refine “creative sharing” metrics as a more human-friendly indicator of humankind development than GDP in the intellectual, creative capitalism era transition.

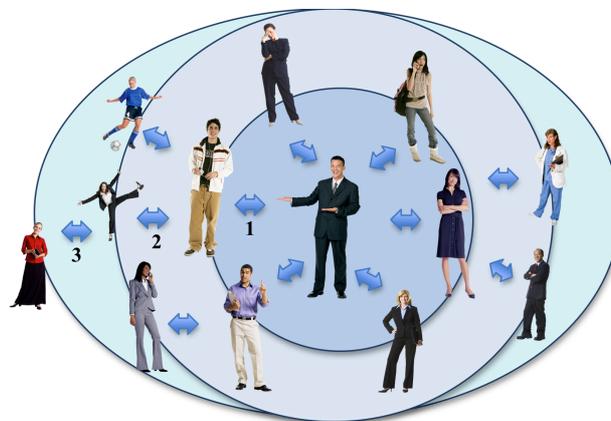


Figure 1 – Recursive degrees of “creative sharing” propagation

Creative sharing: Human Potential Development estimation	1 <sup>st</sup> degree impact: Peers	2 <sup>nd</sup> degree impact: Peers of peers	3 <sup>rd</sup> degree impact: Further peers	Influence depth: Nb of peer degrees
Medieval Compagnonnage	1-10 apprentices	Neglectable in lifetime	Neglectable	1-2
1960 TV Movie	Millions viewers	0.01% interactions	Neglectable	2-3
2011 Web2.0 Blog interactions	10-1000 readers	0-10% of 1 <sup>st</sup> degree	0-1% of 2 <sup>nd</sup> degree	4-5 (Twitter evidence)
2050 Ideal Vision	150 (Dunbar number)	150*150 interactions	150*150*150	6-7 (6 degrees theory)

Table 1 – Preliminary estimation of “creative sharing” impact and influence measurement along human potential development history.

## Backgrounder

All humans share **fundamental needs**: physiological needs, safety needs, social relationships needs, self-respect and self-esteem needs. And those who have fulfilled their fundamental needs further share the **extra need to realize their full potential** [1].

Tremendous economic progress over the past four centuries has brought humankind to an unprecedented level of comfort with regards to the fulfillment of human fundamental needs, and this trend is even further accelerating in the early 21<sup>st</sup> century, as two more billion middle-class people from a dozen emerging economies will roughly triple their wealth over the next decade [2]. In that context, most human progress metrics have so far focused on measuring the fundamental needs fulfillment, either indirectly by metrics like the GDP (Gross Domestic Product) or more directly as in OECD Quality of Life measurements, covering life expectancy, infant mortality or subjective well-being statistics as well as safety-related measurements such as prison population or road fatalities statistics [3]. More recent measurement proposals also address the higher level fundamental needs such as the mental and emotional health of a given population by further assessing mental, workplace, social and political wellness in addition to the basic economic, environmental and physical wellness needs [4]. However the latter metrics still fail to measure an essential component of both further self-potential development, at the individual level, and human potential development, at the global mankind level. What is so unique in humans that even the most developed animals do not share with us?

*Laughing?* Wrong. Young apes laugh in a way similar to human infants [5].

*Language?* Wrong. Bonobos have learnt to practice symbol-based language [6].

*Calculus?* Wrong. Computers have long outperformed us in that area.

*Knowledge?* Wrong. Google servers handle more than any single human brain can acquire, store, and process on its own.

*Creativity?* Right! But not just the ability to generate problem-solving creative solutions – here again, beyond apes, even birds such as crows exhibit such capability [7]. We rather mean creativity:

- As initiated by a single individual, able to mentally project his or her self in abstraction (different place, different time, different paradigm) to **imagine and conceptualize new ideas** - this ability is unique to humans.
- And that is further **shared with and spread to and enriched by other individuals** – this ability is also unique to human social groups, enabling our kids to inherit the whole knowledge we transmit them from our ancestors through education, while other animals, including apes, only learn by imitation on their own initiative, not from social learning such as dedicated teaching initiated by the adults in any humankind society [8].

This “**creativity + knowledge sharing**” capability makes us unique as an intelligent species and enabled the fantastic humankind progress over the past 300000 years: from prehistory to modern era, all human civilizations have produced creative inventions and original artistic works. This development even further accelerates as we progress into the knowledge economy era of the 21<sup>st</sup> century: up to 80% of the valuation we collectively attribute to publicly quoted firms in the current Western markets is already made of intangibles such as know-how, trademarks, design, and patents rather than tangible assets [9].

So... why don't we measure it as a core component, if not the core component, of our human potential development?

## Creativity sharing metrics

In order to define a **creativity sharing metrics or index**, obviously as a combination of multiple factors, we first look at existing metrics and indicators on the creativity side on the one hand, and on the knowledge sharing side on the other hand. Then we confront them to retain only the most relevant multi-factor measurement combinations and we propose our own measurement model adaptation accordingly in the next section.

**Creativity** is drawing more attention in developed countries as they bet on **innovation** to sustain their economical growth pace besides their slowly growing, aging population and saturated consumer goods markets [10][11][12][13]. A **creativity index** has been proposed by Richard Florida to measure the ratio of creative economy at city or state level, based on an equal combination of the “creative class” share of the workforce (dedicated creative process/innovation workers and more general knowledge-based workers), the Milken Tech Pole index, the number of patents per capita and the Gay Index (assumed to measure diversity/openness)[14]. The value of this index has however been disputed in a number of third party studies [15]. More recently, European Affairs published a creativity index proposal based on 32 indicators along 6 pillars of creativity: human capital, openness and diversity, cultural environment, information technology penetration rate (defined as “technology”), institutional and regulatory environment, creative outputs [16]. In our view, one major issue with the Kern approach is that it explicitly excludes technology-based creativity and innovation measurements based for instance on scientific publications and patent applications from its creativity index, as it rather focuses on the **culture-based side of creativity** – while the technology and science-based

type of creativity has historically shown much more impact at the economy level. Thus, none of those creativity metrics are satisfactory enough to directly solve this ideation challenge, in our view, although some of the underlying metrics can be used as raw complementary indicators in a multi-factor approach, in particular the metrics from Kern on the culture-based creativity assessment.

**Knowledge sharing** is a more conventional area of measurement, with a number of obvious indicators relating to **education** on the one hand, to the **spread of information technologies and communication networks** on the other hand. Emerging **social networking** deserves particular measurement attention as it offers an unprecedented opportunity to accelerate human knowledge sharing. Knowledge transfer was restricted to local B2B exchanges from masters to apprentices in the Middle Age Compagnonage times, and still limited to B2C broadcast from a few selected leaders to mass audience in the modern age media, from Gutenberg printings to TV channels. Web2.0 now enables C2C knowledge sharing generalization independent of place (within the limitation of language capabilities though) and time (as long as the computer cloud keeps on storing web archives). The development of knowledge sharing between humans can therefore be measured by proxies such as the rate of broadband penetration, the number of blogs or tweets per capita. However, this does not capture the actual rate of our creative sharing focus, as by far the largest part of the information exchange over the web is not of creative source (e.g. news items, weather, webcams, on-line gaming...).

Therefore, we propose a more dedicated approach by evaluating the actual **spreading rate of a creative work** in human societies rather than measuring general information spread at macro level. A more global measurement can then be calculated in a second stage by averaging the spreading rates of a statistically representative set of creative works – at local, regional or global level, per sector, etc.

The scientific and technical community is already using the number of **citations** (i.e. knowledge spreading) as the main indicator to measure innovation and research outcome of scientific publications (scientometrics) [17] or patents [18]. Currently those indicators are computed out of widely accessible publication or patent databases that systematically register creative work data with bibliography information, but they still suffer from some inherent limitations, in particular:

- They capture only 1<sup>st</sup> degree citations, that is the number of direct citations of a given creative source work, which efficiently tracks the disruptive innovations sources but is less suited to measure the spread of iterative improvements.
- Most of them do not separate self-citations from third-party citations. Self-quoting is obviously a bias to our knowledge sharing focus and should not be considered in the evaluation as such; however, when there are different co-authors/co-inventors quoted in the work, there is evidence of creative knowledge sharing, so such self-citations should still count.

To improve those metrics, recent research inspired from social sciences also investigates the **scientific collaboration networks and endorsement patterns** as a complementary measure of the impact of a scientific work (for instance [19]). Furthermore, **Webanalytics** can be used to approximate the actual spread of the Internet-published works within web communities in a more general way: as more and more artworks also get shared over the Internet (e.g. myspace, myartspace, artnet, etc.), such tools can even be applied beyond scientific and technical publications for which bibliography citations are a convenient tracking information, but hard to generalize to other creative works. Most current web analytics techniques require that trackers be attached to the original works, in particular the just announced Google authorship markup [20]; but we envision that this limitation will be addressed by emerging semantic web analysis within the next decade or so [21].

## Creative sharing measurement model

In practice, human brain limitations are such that one can only efficiently **interact** with a community of about 150 people (Dunbar number [22]) even within virtual social communities as evidenced from Twitter [23]. In contrast, broadcast communication can spread to masses, but it is typically one-way, without interaction, which limits its influence; as an illustration, educational programs on TV do not replace school learning based on interaction, and remain more efficient when enriched by discussion between children and parents or teachers about the program [24]. In fact, humans only fully master a new notion not just when they know about it, but when they are able to teach it through... interaction. Therefore, we propose to approximate the creative sharing strength of any given creative work by measuring its **interactive spreading rate**, not just its broadcast spreading rate:

- The inventor at the origin of the creative works will typically advertise for it as widely as possible, so first degree broadcast spreading does not meaningfully capture the creative works influence but rather the ego and/or conventional communication media visibility impact of the author - what existing citation metrics primarily capture today.
- The first degree interactive spreading measure is more relevant because it enables the inventor to directly teach his/her peers, get their feedback for further improvements (“creative sharing”) and have them further spread the discovery to their own connected peers. Blog comments and open innovation projects are a good example of such interactions.

- The second degree of spread is even more relevant, because when any of us interacts with his/her 150 Dunbar peers, focus is put on what is really valuable to them – less relevant knowledge is just filtered out.
- The original inventor leadership impact may still influence the second degree of spread, but no longer significantly in further spreading degrees. Fortunately for human inventors, any two people are statistically only separated by 6 others in today's humankind [25], so a very relevant human discovery can theoretically spread very efficiently to the whole society in just a few recursive interactive communication steps (Figure 1).

So we propose the following creative sharing measurement model:

1. Out of the Human Potential Development activities to be evaluated, select a creative work source: a scientific publication, a patent publication, a book on Amazon, a piece of music on MySpace...
2. Measure the number of citations (degree 1) referring to this creative work source (degree 0), using the tools appropriate to its publishing mode. This can be achieved with today's software tools out of bibliography or patent databases (with appropriate self-citation and examiner citation filtering), or by web analytics tools, or by audience analytics for TV/radio broadcast, number of sales of Amazon books, etc. The result quantitatively captures the first-degree creative sharing impact:  $d_1$ .
3. For each identified first-degree citation, measure the number of forward citations (degree 2) referring both to the creative source (degree 0) and the first-degree citation (degree 1). A re-tweet for instance quotes both the original source and the intermediate tweeter proxy. Similarly, a patent information disclosure statement fully compliant with the US patent office rules also quotes both the original work and the intermediate further work built upon it, which is a good indication of creative sharing. The result is the second-degree creative sharing impact of the original work:  $d_2$ .
4. Repeat step 3 for each recursive level: measure the number of forward citations (degree  $i+1$ ) referring both to the creative source (degree 0) and the  $i$ th-degree citation of the creative source (degree  $i$ ), until none can be found. This provides a series of creative sharing impact measurements, one for each referring depth level: ( $d_1, d_2, d_3, \dots, d_i, \dots, d_n$ ).

This raw metrics quantifies the “creative sharing” **impact** (the  $d_i$  values) and **influence** (the  $n$  value) for each creative work. It is then possible to compare various creative works based on these metrics, and to compile them to assess a given set of human activities at local, global, or sector level.

## Conclusions

We propose to develop a Human Potential Index based on the “creative sharing” unique ability of human beings, and we described how to already measure the “sharing” influence and impact of any published “creative” work by using the latest citation analysis and web analytics tools.

Computing a simple human potential index out of our proposed “creative sharing” multidimensional metrics still requires data calibration (making comparable diverse sources of creative works) and reduction of the currently proposed metrics data set into a single number index. These refinement steps can be built from real data experimentation and model improvement by a transversal team of worldwide experts from various fields: creative capitalism modeling, in particular around better economical evaluation and reporting of intangible assets primarily associated with financially valuable human creative productions; web analytics; bibliometrics; and social sciences.

That is obviously beyond the reach of this ideation challenge initial proposal, but as supporting evidence to our idea, we already estimate that the “creative sharing” metrics capture the human civilization progress as an increase in both the impact and influence metrics measurement, just as the GDP did until now (Table 1).

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# Creative Sharing Index

Human potential is already enabled; we just need to better measure it.

The Economist-InnoCentive Human Potential Index Challenge

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