Manuel Castells & Negative Informational Productivity

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Abstract

Castells' "Informational Economy" and "Productivity Enigma" are carefully analysed, and a new "Negative Informational Productivity" (NIP) hypothesis (generalised from the software management literature) is proposed to help explain the latter. Analysis then indicates that NIP appears to be connected with four of Castells' six suggested Productivity Enigma hypotheses. NIP's links with Castells' Network Society, synergy, and team size are then explored: further, Castells' "four-position" global economy is reassessed as being close to a higher-level rendering of Michael Porter's theory of clusters. Finally, Castells' Network Society is criticised as falling between the two stools of industrial and informational: and implications of having two independent productivities (and hence two independent economies) are discussed.

The "Informational Economy" and the "Productivity Enigma"

Castells asserts that *"productivity and competitiveness… fundamentally depend upon [firms', regions' or nations'] capacity to generate, process and apply knowledge-based information"*. (p.66) [1]

What is the mechanism behind this? He claims that a *"networked deeply interdependent economy emerges that becomes increasingly able to apply its progress in technology, knowledge, and management to technology, knowledge, and management themselves."* (p.67)

How is this mobilised? *"Such a virtuous circle should lead to greater productivity and efficiency, given the right conditions of equally dramatic*

[1] Note: as this paper refers extensively to Manuel Castells' "The Information Age: Economy, Society and Culture" (Volume 1: "The Rise of the Network Society"), all floating page numbers ('p.xx') in the text should be understood to be specifically referring to this.

organizational and institutional changes". (p.67)

Further, Castells asserts that "*productivity drives economic progress*". (p.67)

One might therefore present his chain of reasoning something like this:-

	Capacity to generate/process/apply information/knowledge
Plus:	Progress in technology/knowledge/management applied to themselves
→	Potential for greater productivity/competitiveness
Plus:	Dramatic organizational and institutional changes
→	Actualised greater productivity/competitiveness
→	Economic progress

Given that Castells also points out that "*information and knowledge have always been critical components of economic growth*", (p.66) his "*capacity to generate…*" appears insufficient to differentiate between an informational economy and a non-informational economy.

Similarly, "*dramatic organizational and institutional changes*" would seem to be a perhaps necessary but certainly not sufficient differentiator.

Critically, Castells' idea of an informational economy seems, then, to rest almost entirely on the idea of technology/knowledge/management being applied to itself - organisational self-improvement through knowledge, with the 'proof' merely being his assertion that this "*should* lead to greater productivity and efficiency". As if to acknowledge this doubt, Castells immediately looks for external verification: "*If there is a new, informational economy, we should be able to pinpoint* [ie, through statistical analysis] *the historically novel sources of productivity that make such an economy a distinctive one.*" (pp.67-68)

However, despite extensive statistical analysis, he then finds that "*the pace of productivity growth in the last two decades does not seem to [covary] with the timing of technological change. This could indicate the absence of*

substantial differences between the 'industrial' and the 'informational' regimes of economic growth… thus forcing us to reconsider the theoretical relevance of the distinction altogether." (p.74)

Castells calls this (apparently paradoxical) idea of *"vanishing productivity growth in the midst of one of the fastest and most comprehensive technological revolutions in history"* (p.74) the **"productivity enigma"**. Though he goes on to discuss *"a number of hypotheses that could help to unveil the mystery"*, it must be stressed that if this enigma cannot be explained, then the whole idea of the informational economy cannot be substantiated.

Castells' Six Hypotheses to Explain the Productivity Enigma

Castells gives six hypotheses to try to explain this phenomenon:-

1	**Economic historians' "time-lag" hypothesis**	***p.74***
2	**The difficulty of measuring productivity for service industries**	***p.75***
3	**The catch-all nature of "services" in productivity statistics**	***p.75***
4	**Distortions from trying to measure software and R&D investment**	***p.78***
5	**Difficulty in measuring prices for rapidly changing services**	***p.78***
6	**Contradictory growth/obsolescence trends within the same figure**	***p.86***

These - and many others, like Stehr's (1999) supply-side hypothesis (linking the phenomenon to the growth of the number of knowledge-based workers), and Brynjolfsson and Hitt's (1996) conclusion (that the productivity paradox had disappeared by 1991) - have been debated extensively in the literature, yet somewhat inconclusively.

However, it is hard not to draw the conclusion (from these varied critiques) that the traditional concept of productivity itself may be somehow flawed or inapplicable - that it may, in fact, be more like an *artefact* of an economic system, rather than a *metric* of it. Perhaps a deeper understanding

of a different kind of productivity would be required to understand this enigma.

The "Negative Informational Productivity" Hypothesis

A new "negative informational productivity" hypothesis is advanced here, which seeks to explain the relationship between productivity and knowledge by generalising insights into software development from the software management literature (and from the present author's own experience in the software industry).

Much of the software management literature can be said to have been defined by two seminal pieces by Frederick P. Brooks Jr. In his book "The Mythical Man-Month: Essays on Software Engineering" (1975) based on his experience at IBM, Brooks argues that the relationship between productivity and team size (in a collaborational development environment) is nonlinear and complex, and so the industrial concept of a "man-month" fails to be applicable - in fact, increasing team size often slows projects down, delaying delivery.

In his provocative paper "No Silver Bullet" (1986) based on his later experience chairing a Defense Science Board study on military software, Brooks predicted (successfully) that no single technique would be found in the following decade which would increase software productivity by an order of magnitude - his key argument was that software productivity was now constrained more by collaborational problems than by technical issues.

The hypothesis proposed here, then, is simply a generalisation of Brooks' insight: that **informational productivity** (a more general version of Brooks' software productivity) suffers from **production-side diseconomies of scale** - but that, in combination with the trend for informational projects to increase in size (in line with rising expectations), this leads to **negative informational productivity**.

One might object to this, by suggesting that informational productivity

is not a significantly broader notion than software productivity: however, it should be pointed out that a company's R&D, its business model spreadsheets, its accounts and financial reports, its website, its customer support activities, its budgets, and perhaps even its strategy are all typical examples of this kind of collaborational informational activities.

Informational productivity, then, can be seen to have a very different profile from traditional economistic conceptions of productivity: it is constrained not by the **sequential logistics** of supply chains and job simplification, but by the **parallel logistics** of networks and collaboration.

Negative Informational Productivity (NIP) and Castells' Six Hypotheses

Here, the likely relationships between this new hypothesis and Castells' six hypotheses (listed above) are suggested: however, note that these would need to be tested empirically.[2]

Hypothesis 1 **(Economic historians' "time-lag" hypothesis).**

[No apparent relationship]

Hypothesis 2 **(The difficulty of measuring productivity for service industries)**

[Correlated with NIP]

Castells seems ambivalent about this, calling McKinsey Global Institute's (1992) study an "*interesting effort*", as it focused on five "*relatively easy to measure*" service industries. (p.75, note 20) [3] Trickier services, like "*education, health services, government*", (p.75) are more obviously informational than industrial: perhaps future analyses grounded more on NIP principles might yield more insightful results than

[2] *...though this is left as a task for future research.*

[3] *The five service industries studied were: Airlines, Retail Banking, Restaurants, General Merchandise Retailing, and Telecommunications. One conclusion was that "[h]ow workers were organized to create outputs turned out to be more significant than differences in capital intensity or scale of operations."*

ones looking for more classical productivity metrics. [4]

Hypothesis 3 (**The catch-all nature of "services" in productivity statistics**)

[Correlated with NIP]

Castells calls the services category a "*residual, negative notion*". (p.75) However, NIP implies that even the manufacturing category is a residual notion - the real division is now between (serial) industrial and (parallel) informational, and even that is insufficient to form a binary either-or categorisation (as companies typically rely on both of them).

Hypothesis 4 (**Distortions from trying to measure software and R&D investment**)

[Implied by NIP]

Software and R&D are, as discussed in the previous section, merely the tip of the informational iceberg - collaborational informational activities are now pervasive throughout contemporary organisations.

Hypothesis 5 (**Difficulty in measuring prices for rapidly changing services**)

[No apparent relationship]

Hypothesis 6 (**Contradictory growth/obsolescence trends within the same figure**)

[Implied by NIP]

NIP would indicate that combining (positive) industrial productivity with (negative) informational productivity is highly likely to provide inconclusive and internally contradictory statistics. How to assess the degree to which any firm's inputs, processes and outputs are industrial or informational is likely to remain a moot point for some time: deeper research would be needed to suggest ways in which current statistical regimes could be altered to better capture these differences.

Interestingly, while NIP seems to resonate strongly with four of the six

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[4] *In fact, a deeper study of such services might well yield theoretical grounds for opposing metric-based micromanagement (as being anti-collaborational).*

hypotheses, it appears to be independent both of economic historians' "time-lag" hypothesis (by which deep technological changes [like the introduction of electricity] may require decades to show up on statistics), and of the measurement difficulties for a rapidly changing economy. For the latter point, Stehr (1999:5) remarks that Castells "*does not indicate how one might be able to 'heal' the deficiencies of the current statistical regime*".

NIP, the Network Society, and Synergy

NIP is very much aligned with Castells' concept of a Network Society: effectively, Castells is talking there about the devalorisation of seriality (even of multi-seriality) and the (relative) valorisation of complex parallelism.

By that thesis, classical industrialism is based upon a serial, deterministic worldview - that everything can be reduced to a sequential, stepwise process, much like pin production (as famously described both in Adam Smith's "Wealth of Nations" (1776) and in Charles Babbage's "On the Economy of Machinery and Manufactures" (1835)[5]). By way of contrast, the emerging network society Castells points towards is based upon a parallel, non-deterministic, interconnected worldview - that difficult problems can only be tackled by non-deterministic network-like processes (and that solving difficult problems has disproportionate value).

However, NIP points to a glass ceiling for the effectiveness of networks, not really acknowledged by Castells: while we may well be heading towards the kind of network society he envisages, the software management literature (and NIP) strongly indicates a systematic productivity slowdown along that road.

Peter Drucker (1999:141) perceptively points out that the issue is no longer how "*to make manual work productive… the central challenge is to*

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[5] *For an accessible account, see chapter 2 of Nathan Rosenberg's (1994) "Exploring the Black Box".*

make knowledge workers productive".

NIP also sits uncomfortably with the idea of synergy, which is often presented as a similar kind of network benefit: positive synergy may well exist for *industrial complementarity* (say, post-M&A), but NIP might well predict negative synergy for *informational complementarity*. The recent merger of Lloyds Bank and the TSB illustrates this: post-merger, the TSB's back-office IT systems were taken on by the whole group, but at the cost of imposing its (quite different) operations culture on Lloyds staff, lowering productivity. [6]

NIP, Hausdorff Dimensionality, and Team Size

Mathematically, "Hausdorff dimension" is a measure of the "dimensionality" of a fractal line (such as a country's outline on a map) - that is, the degree to which it has a solid geometric dimension. One might similarly look at the dense (parallel) interconnections within a company's internal network and wonder what the "dimensionality" of it is - for a classical industrial company, it would surely be close to 1.0 (ie a simple line), but for a collaborative knowledge company?

However, NIP points to high-density social fabric as causing a reduction in productivity for network companies: so the richness arising from these complex interconnections comes at a communication cost. Frederick Brooks' (1975) experimental data pointed to 3-8 individuals as an optimal team size: more recently, a number of software companies have, aiming for higher productivity, tried to reconfigure their large-scale developments into "partitioned" collections of smaller (and hence theoretically more productive) teams - though it should be noted with only limited success to date.

Overall, the lesson from software appears to be: ***collaboration is hard***.

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[6] *Based on informal conversations with Lloyds TSB staff.*

NIP, Castells, and globalization

Castells proposes that the international pattern of labour division now emerging has four positions - **high value** (informational), **high volume** (low-cost labour), **natural resources** (exploitation), and **devalued labour** (redundant producers) - but that these positions "*do not coincide with countries… all countries are penetrated by the four positions*". (p.147) Yet elsewhere he also appears to equate the informational economy with the global economy (pp.102-103), while simultaneously asserting that "*most people on the planet do not work for or buy from the informational/global economy*", (p.103) that the global economy "*is not a planetary economy*".

Given his dogged pursuit of productivity within aggregated world statistics (pp.106-146), this might be seen as a somewhat defeatist view: that the global economy does not express itself in such international statistics, but instead works as a kind of segmental arbitrage internal to global-scope companies ("*increasingly globalized economic agents*"), (p.102) as they choose how to reconfigure themselves across geographic resource clusters. As an example, Nokia (when looking for skills unavailable in Finland) turned to Microsystems in Austria for in-phone circuitry, AT&T for R&D, and Du Pont in America for polymer skills (amongst many similar alliances and partnerships).[7]

Castells' four positions, then, would seem to be a higher-level rendering of Michael Porter's theory of skills clusters,[8] but viewing all forms of resources (whether natural, skills, or wage arbitrage) as potential clusters.

high value	=>	*informational clusters*
high volume	=>	*low-cost labour clusters*
natural resources	=>	*resource clusters*
devalued labour	=>	*(everywhere else)*

[7] *Source: Palmberg and Lemola's (1998) EC paper "Nokia as a related diversifier"*
[8] *Porter (1998) "Clusters and the New Economics of Competition"*

Castells further asserts that the "*relentlessly variable geometry that results… struggles with the historically produced architecture of the world economic order, inducing the creative chaos that characterises the new economy*". (p.147)

However, the core implication of NIP - that there are two productivities (and hence two economies) at play here - would tend to indicate otherwise: the new economy is perhaps more characterised by the economic and accounting chaos surrounding companies' attempts to reconcile these two very different kinds of productivity.

Conclusions

In many ways, Castells is caught between a rock and a hard place - between the classical, economistic view of (serial) industrial productivity *(with its characteristic economies of scale, and with quality bracketed)*, and the emerging, embryonic view of (parallel) informational productivity *(with its characteristic diseconomies of scale, and with communication risk bracketed)*.

His view of an emerging network society, while accurately reflecting societal change, fails however to be adequately tempered by a deeper understanding of the emerging dynamics of informational productivity.

In what terms, then, should we seek to define Castells' "Informational Economy"? If "*the specific ways of increasing productivity define the structure and dynamics of a given economic system*", (p.67) we can perhaps now use these two types of productivity as drivers of two independent (yet coexisting) economic systems - an *industrial (hierarchical) economy* and an *informational (collaborational) economy*. Perhaps this is what drives economists' frustration when trying to quantify concepts like "human capital" and "network capital" - they are typically defined as forms of capital in this purely informational economy where risk (and hence future performance) is innately bracketed (and

hence econometrically useless).

It might well be that the dot-com boom-and-bust arose largely from the ambiguities arising from the interplay between these two economies: however, the underlying difficulties (valuation, investment and conversion) inherent in having two independent economies coexist appear far from resolved - as are the long-term difficulties arising from negative informational productivity.

The software management literature cautions us that, collaborationally, we are only at the start of the road - and that no obvious roadmap is in sight.

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