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Chain-computerisation!

Chain-computerisation in a historic perspective

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Abstract: Chain-computerisation will be placed in a historic perspective. The tenet is based on the principles that were advocated as early as 1969 by Blumenthal and that, as of today, have not lost any of their legitimacy. Logistic chains, supported by electronic messaging, were introduced in the 1980s in The Netherlands under the inspired leadership of the late Albert Heijn. In the 1990s, the computerisation of social chains received the necessary attention, with the government fulfilling a significant role. The doctrine of 'Chain-computerisation' -- the subject of Jan Grijpink's dissertation in 1997 -- offers the theoretical foundation and practical pointers for this, a few of which will be discussed in this article. We will conclude with a glance into the future that is characterized by mobile and worldwide communications within a great diversity of chain systems.

Keywords: Total Systems, complexity, information infrastructure, chain-computerisation, dominant chain problem

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1 The great development plan!

On 10 December 2010, the experienced information analyst and manager, Jan Truijens, obtained his doctorate at the University of Amsterdam with a dissertation entitled: 'Information Infrastructure, guarantee for the quality and timeliness of information management' (Truijens, 2010). It is a very thorough study with extensive literature reviews and comparisons. Briefly summarized, one of his most important statements is that it is not possible to make a blueprint-like plan for the provision of information. Methods that were propagated in the past were based on the idea that it is possible to 'start from scratch'– an illusion in daily practice. In that practice, one is confronted with all kinds of legacy systems, an inheritance from the past that cannot be swept away just like that. Moreover, the dysfunctioning of all those systems and the near unchangeableness of it all can, according to Jan Truijens, be attributed to the lack of a decent information infrastructure. I completely agree with him there. One image that I often use here is that of a slum. Nearly everyone who has ever traveled through Asia or South America has been confronted with life in a slum and has experienced the proverbial culture shock. What actually makes a neighborhood into a slum? Is it the shabby little dwellings and cottages; is it the bitter poverty of the residents; is it the nearly incalculable number of people squeezed together in a small area? In my opinion, the main characteristic of a slum is the absolute lack of infrastructure: no plumbing – with all of the accompanying consequences -- no water, no electricity, no communication connections, etc. And, if one wanted to introduce such an infrastructure, anyway, the only thing to do would be to tear down all of the shacks (legacy) and rebuild from the ground up.

What does all of this have to do with information infrastructures and with chain-computerisation? Actually, in the area of information, there were also many 'information slums' in the past, which had been created one-by-one as information

islands. In the second and following phase, the idea was to allow these ‘islands’ to be able to talk to each other (via chain systems) but that proved to be nearly impossible to achieve. Compare current, so-called ‘super-modern systems in healthcare, law enforcement, fire prevention, in various industries, etc.
The discipline of information science or computer science has never been able to solve the problem of integrated systems satisfactorily. Perhaps it is not a solvable problem, at least not with the classical method of information development. To be sure, one can find numerous methods in the literature for grappling with matters in a more integrated manner, but they have proven to have little to no effect, at all. The main reasons for this are both the complexity of integrated designing and constructing and the state of the technology. Even if it were methodologically possible, sometimes the technology has not yet been sufficiently developed to be able to design an integrated system for something and to build it. Take the simple example of the bar code on products – something I will refer to later on. Without scanning technology, such a coding system is essentially useless and the code cannot be used to develop logistic chains. Once the technological barrier was broken, the implementation of the Uniform Article Code (UAC) quickly followed, with major consequences for a chain approach. The current identification of goods (or other objects or subjects) can be done with the aid of RFID: Radio Frequency IDentification, a method for scanning from a distance. Technology is constantly moving forward.

Let us step back in time. Within the discipline of information systems, Blumenthal et al advocated in 1969 -- in his famous book, Management Information Systems -- for more coherence in information systems (Blumenthal, 1969). He designed complete typologies of departmental systems with the objective to achieve coherent (and, in any case, not contradictory) management information.
Why, at that time, was there so much interest in management information? The answer is simple: During that era, computer applications were in the process of developing from ‘real computing machines’ to ‘decision machines.’ At that time, many automation specialists and managers believed in a comprehensive MIS. After all, ‘the computer could do anything at all, couldn’t it!' Some have never lost that conviction and are still preaching it today! Ackoff said, in 1967, that he found that to be the most absurd of all technical innovations (Ackoff, 1967). In his view, it was nonsense to think that there could be something like a ‘Total Management Information System’ where all information could be stored. The practice has only proven him right, however powerful and mighty computers have become and will become in the future. Nonetheless, ‘true believers’ continue to exist who claim the opposite and still believe in all-encompassing systems and databases—and the idea that great prosperity will be bestowed on us, once these systems have been centralized! Centralization is, they believe, the ultimate panacea.

Back to Blumenthal: he did not advocate a Total System but a more matched entity of subsystems, also knowing that the construction of a Total System would be much too complex and would exceed the possibilities of the (then) technology many times over. His message was adopted by many and translated into all sorts of studies and recommendations for what would later be called information policy and planning c.q. information strategy – as the start of the developmental cycle of separate information systems. This ‘blueprint’ was dismissed in Jan Truijens’ dissertation as unattainable and unworkable. And, for the most part, I agree with him. Anyone who sees the current explosion of technical possibilities and applications can do no less than come to the conclusion that the kaleidoscope of information systems will only increase. Every person will have several information systems; thus, many billions of systems will exist. Every user can use microsystems (mobile phone, GPS navigation, hand-held apparatuses, notebooks etc.) to create

and develop his own personal information world. It is truly becoming 'end user computing' and that is where it belongs. It is an illusion to believe that something like this can be provided with -- and developed into -- an overall plan. There will be no single unity in this colourful diversity!

Back to our previous image of slums: in fact, the connecting factor amidst all of this diversity is the infrastructure. In the case of information provision, that infrastructure contains a generic and relatively permanent basic facility for data processing, storage and data exchange. It is all about generic facilities (computers, data bases, end user tools etc.) that are generally available for practically everyone and that will be around for a long period of time. A search machine such as Google or an operating system such as Windows (in its various versions) can be included in the infrastructure -- although it was, perhaps, not initially seen, or intended, as such by the developers. But through rapid, worldwide success, these things have been elevated to infrastructure status. Internet, with a worldwide distribution structure of consultable databases, is perhaps an even clearer example. In fact four major components are part of an information infrastructure:

- generic technical facilities as indicated above,
- common databases and knowledge bases (for example article files and customer files in business, medical files in hospitals etc.)
- common software packages for all kinds of management and control (for example SAP as a standard software package for production control)
- common procedures and supervision mechanisms for information management (think about security issues for example)

This list also proves that infrastructures must be planned and managed if the requirements of continuity, general availability and standardization are to be met. Issues that belong to infrastructure place obligations on the original suppliers of those facilities. It is not possible to simply quit for financial or other considerations.

With this kind of planning, don't the same problems come up as with the well-known blueprints of the past? The answer is, in part, yes, but the obstacles in infrastructure can be conquered more successfully. With infrastructure, there are clear limitations with respect to policy and planning; it is not about the end user computing applications on a staggering scale, but about basic provisions (technique, software tools, data, and organization) which everyone can fall back on. And people need those basic provisions if they want to achieve more cohesive systems: chain systems, as will be shown below.

2 Logistic chains

In the late 1970, the excessive attention for management information systems was abandoned. The primary work processes again became the central focus (something that I would still like to advocate today). It is not until those primary systems are more or less in working order that one can start to think about the 'upper echelons' such as management information. In factory environments, a great deal of time and energy is invested in more comprehensive systems, starting with MRP-I (Material Requirements Planning). A well-known computer version of this was Coopics, a system developed by IBM. In discrete manufacturing, such systems are essential in order to discover which parts and intermediates are necessary for a specific number of finished articles. This then becomes the basis for a purchasing and inventory policy.
After MRP-I, the MRP-II was developed which included the new element that one did not only look at the material needs (derived from the Bill of Material, or BOM) but also at the capacity requirements. That made the factory planning a good deal more complicated, because now there must be simultaneous optimization of more

bottlenecks. In the following step, MRP evolved into the current Enterprise Resource Planning systems, or ERP. We then arrive at a new development, namely that it is now not only about internal business matching, but that the matching now exceeds the boundaries of the enterprise itself. Logistic chain thinking has then been put into effect.

The process of becoming aware of external matching started in the mid-1970s and early 1980s. In many places in the world, people started talking about all kinds of exchange protocols for data within and among organizations. That led, after a number of years, to the international standardized EDI protocol, an exchange protocol for electronic messages among computers without human intervention. At that same moment, the technology became available to couple things together outside the boundaries of one's own enterprise and to computerize them collaboratively. In The Netherlands, in 1988, the Ediforum was founded under the chairmanship of Albert Heijn himself. I have had the privilege of attending many gatherings and meetings of that forum and what struck me was that Albert Heijn never missed a session. That is characteristic of a great entrepreneur: someone with a vision of future technological developments and of the impact that they will have for the business world.
Something similar applies to ECT in the Rotterdam harbor, where Wormmeester carried the load for extensive EDI applications. Passionate helmsmen are essential for breaking through the boundaries of one's own organization and making chain logistics actually possible! They were certainly faced with resistance and the fear of relinquishing the individuality of their own enterprise and opening it up to third parties. Thus, an important precondition is formulated for the development of chain systems in a multi-party model: a strong (dominant) party is essential in order to force progress! What is needed is someone 'on the barricades!' Remember the saying that it is only under high pressure that 'everything flows.' In the case of store systems and all of the involved suppliers, that was proven when the supermarket giant Albert Heijn was able to put so much pressure on the suppliers that they were forced to convert to EDI and to an uniform article coding system.
This brings us to the next important infrastructure precondition of chain-computerisation, namely clear identification of objects and subjects – something that Jan Grijpink indicates explicitly in his dissertation of 1997 (Grijpink,1997). In article-land, it was customary up until the 1990s for every company and every department to wield its own identification of articles and parts. That was simply how it went historically and it proved exceedingly difficult to change because it not only required a change in the mind-set but also a complete change in the coding system (just think of the current issues in several European states with the codification of patients or students). Once again, it was Albert Heijn, under whose chairmanship The Netherlands set to work on a uniform article-coding system, internationally in line with the worldwide standardization of article coding. Everyone is familiar with the end result: the bar code on all kinds of articles in stores or factories. This also applies to 'cow identification' by means of the electronic ear labels, train car or container identification with built-in chips, etc. Consider for example the colorful variety of electronic identification cards, depending upon the chains within which a person operates. Proposals to standardize all of that are plentiful, but whether or not that is desirable and sensible is still a very good question. I know that I have Jan Grijpink's support when I advocate more identities for people depending upon the chain in which they find themselves or which they are dealing with. Thus, one should not want something like one all-encompassing and uniform human coding for all systems in which these people operate or could start to operate. That would be the same overestimation as the famous Total System which Ackoff warned against – and not only Ackoff! Moreover, it would threaten the protection of personal privacy if subjects, through only one unique

piece of identification for all systems (not necessarily a number, in future possibly the human genome?) could be identified and followed. Very often it appears to be a wise strategy to distribute - as much as possible - the several pieces of information, in view of the danger of misuse of information by bad willing persons or organizations.

One extraordinary aspect of chain-computerisation is the manner in which one defines a chain. That can be done in various ways, just as 'more than one road leads to Rome.' What is ultimately a sensible and effective choice depends mainly upon the dominant chain problem and the parties involved. That, too, has been developed and illustrated by Jan Grijpink with striking examples. It is ultimately this dominant chain problem that determines who is involved in a chain and in what way. It should also be noted that there are many dominant chain problems which could involve the same parties, over and over again. That results in chains that run through and over each other, a network of all types of chain systems for which different problems to be solved come up at every turn. This, once again, demonstrates that one should not want and cannot do everything in an all embracing, single, large system.

Another salient problem for a chain approach is the question of who benefits and who does not. It is often the case that, somewhere in the chain, there are major advantages for one or more parties, while the costs of implementing far-reaching chain-computerisation are incurred by other chain partners. That does not make it easier to realize chain-computerisation. Just think, for example, of the digitalized police warrants for which the costs are placed on the police organisation and the major advantages are elsewhere in the processing chain – with the courts and the rehabilitation systems. In that case, a good deal of discussion is necessary in order to implement a chain approach. This should ultimately end up with a fair division of the advantages and disadvantages among the chain partners. In the traditional world of computerisation, I have always honored the closed loop principle. According to that principle, systems must be developed in such a way that the advantages benefit, first of all, the most involved input providers. They do carry, after all, the heaviest burden. They must take care of the laborious input of data. An example: many reporting systems have been set up without a closed loop principle. Various parties are asked to supply input for control or steering higher up in the hierarchy or elsewhere in the chain, without providing an advantage to those who must supply the input. Just think of some evaluation systems in education (with students or educational facilities as input partners) or of ill-considered reporting systems by representatives, service technicians, providers of home care, etc. This generally results in a rapid degradation of the input quality: what is put in is what the 'boss' would like to see, because otherwise there will be problems. These are typical examples of a system in which 'one party must act in favor of the other party.' Such a system has proven time and time again that it is an extremely poor design. Something similar applies to a chain approach. Ideally, a design would provide benefits to all participating partners.. However, in a great many cases, this cannot – or only partially – be realised. In my experience, a (financial) compensation would be the obvious solution for the parties who are going to bear the heaviest burden of a chain approach. In this way, a positive incentive is created and the closed loop principle is restored. And again: in practice, it has been proven that, without incentives (including, sometimes, even negative ones such as punishment) no system at all remains 'healthy' (Bemelmans, 1991).

3 Chain approach in government

Within the government, chain thinking has long lagged behind the developments in the industrial and business services sectors. Barring such exceptions as the Sagitta system at customs control (by the way, established, in part, through pressure from the industrial sector!), not so much is happening with the government in order to achieve (administrative and registrative) simplifications. It was not until 2006 that the item of administrative burden reduction was again given a place high on the agenda. The progress is, as yet, limited!

As far as I know, Jan Grijpink was the first to provide a clearly structured dissertation -- from the viewpoint of judicial practice -- on chain-computerisation within the government. In order to do this, he use his own wealth of experience and knows, from that experience, how difficult it is to break though departmental boundaries within the government. He advocates – referring to the decision-making model of Cohen, March and Olsen (1972) – the idea that a problem is only solvable if the importance of the solution is not too great, because a major problem or an important decision brings too many interested parties to their feet. Thus, a stalemate quickly occurs if everyone defends his own interests without wanting – or being able – to force a breakthrough. The more one inflates a problem, the more parties will want to interfere and, thus, the less solvable it becomes!

Also unique in his approach to chain problems is his model of four assessment profiles for the advance recognition and identification of critical ICT-projects with little chance of success. In the collaboration profile, he also distinguishes among various phases of collaboration. Elaborating on this, his recommendation is to first find out which phase of chain collaboration the (major) chain parties are in. If the phase of chain collaboration on the one hand, and the chain-wide information sharing on the other, are too far apart, the chain system has little chance of success. He who wants his reach to exceed his grasp (read: the historically developed form of cooperation) must realise in advance that such a chain project is probably doomed to fail – in spite of the pressure from the politicians who would like to force such a system. It is almost impossible to have parties cooperate when the one is rooted in the ‘stone age’ and the other in the ‘atomic age.’

Just as unique and acute in his analysis is Jan Grijpink’s recognition that, in chains, a number of infrastructural preconditions must be met, among which are: referencing, verifying and numbering. The precondition of the clear identification of objects and subjects by 'numbering' (need not be literal numbering!) refers to the previously provided example of the uniform article coding and other identification systems. In my own career in automation, I have had personal experience with what it means not to have clarity in article and client coding. I still remember so well that clients had several code numbers in our systems (for all sorts of reasons I will not go into here) with all of the accompanying consequences. One specific case we then scrutinized in lengthy ‘listings’ of client data -- impossible drudgery. The client in question proved to come up more than 23 times in one and the same billing system, quite simply because new client numbers continued to be handed out in a somewhat deviating alphabetical sorting of the name. Once we found a client number 23 times for the same client, we stopped searching because the sales data were reasonably in the neighborhood of what we had expected. This is a catastrophe for a policy which should be ‘customer oriented’ and where the customer has the right to an integrated approach (including, for example, receiving discounts in proportion to the invoiced sales). That single incident has remained with me for all these many years and has strongly influenced my thinking and acting with respect to infrastructural groundwork in all types of systems.

Nothing was then known about chain-computerisation, let alone about the technology of electronic data exchange. The latter only truly emerged when computers shifted definitively from calculating and memory automats to communication machines. The mobile phone has, meanwhile, reached a degree of penetration with a speed that that has never before been achieved any previous technology whatsoever. If the figures are to be believed, more than 50% of the population worldwide now has a mobile phone. In Hongkong, there are more mobile phones in circulation that there are people who live and work there. And that is probably not the only place on earth where that is the case. Mobile phones have, by now, developed into multifunctional hand-helds with which -- 'any time, any place' -- one can do business, make contact, take courses or consult the internet (and the new version of internet, developed in China, will be 100 times faster than the present one). The future is mobile and 'going global' – within a great diversity of chain systems. This makes the significance of infrastructural provision all the more important. Without these provisions, no chain systems are possible. Where that will end is difficult to predict. I still believe that we are just at the beginning of the technological developments and, in that respect, there are still great surprises ahead. We and our forefathers have needed more than a century to master the achievements of the industrial revolution. So, how long will it take before the much more radical information revolution evolves into a reasonably stable achievement? There is, I believe, not much point in speculating about this: we have our hands more than full with the possibilities of today and tomorrow. And all of that is certainly not going so smoothly. Here is just one example: the long-awaited electric patient records. Anyone who has observed the medical – and especially the medication -- errors caused by lack of patient information exchange will have little doubt about the necessity of a chain approach in the healthcare sector. The progress, thus far, has been limited due to unilateral accents on judicial questions and on, once again, 'unbridled faith' in one all-encompassing central system. He who -- in a world of numerous legacy systems (and there are more than enough of them in the healthcare sector!) -- wants to get the ball rolling, will do well to respect that diversity and, via for example local and regional reference index registers, ensure the transparency of the chains. That is not the same as forcing all parties 'to start renumbering' without reaping the advantages of all their work: on the contrary! That, too, Jan Grijpink proved in the past with his applications in the judicial chains. You could say: setting a good example creates good followers. But, in practice, we have learned that things never go quite so smoothly. There is still work to do!

Biography: Theo Bemelmans studied Business Econometrics from 1963-1968 at the Catholic University in Brabant. For a number of years, he worked at that university as a research assistant in the Department of Business Econometrics. He got his doctorate with a dissertation on the subject Research Planning in Business. From 1972 to 1978, he was Information Manager and Division Controller Océ in Venlo. In early 1978, he was appointed professor in Management Information Systems and Computerization in the Department of Technology Management at the Technical University Eindhoven where he retired in 2004. At the moment, he is involved in the program Eindhoven Studentenstad [Student City], has a part-time function with The Expertise Centrum in Den Haag and is chairman

of the Thomas More Foundation, previously the Radboud Foundation.

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