Innovative urban temporalities: conceptive and generative temporal regimes

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INNOVATIVE URBAN TEMPORALITIES: CONCEPTIVE AND GENERATIVE TEMPORAL REGIMES

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In this paper, we outline management science in a manner that, we hope, will aid future research on individual and city temporalities. Our research question is twofold, but intertwined: how societal temporalities could be innovative understood as conceptive ("*aspect of mind that can be used to conceive our world anew[1]*") and generative ("*having the power of producing or originating[2]*",)? How firms could contribute to times design in an innovative way?

From our perspective, these questions could be even more generic if we accept the general assumption that firms could be societal mutations producers or contributors. In that, we put aside ethical questions we don't underestimate to concentrate on interactions between societal change, here new time organization, and firm management in public transport sector.

First, we propose a social and technical times science overview to better understand contemporary times factory that we observed through two case studies led in intervention-research. That will give a useful framework to underline firm contributions to times design since 19th. Secondly, that baseline will be used to integrate more specific literature on management science, particularly in organization and design topics.

Before going on our vision of conceptive temporalities, we need to clarify some definitions we will use in that paper: times, temporalities, rhythm and temporal regime. We'll speak about times, and not "time" in Augustinian sense ("*What, then, is time? If no one asks me, I know; if I want to meet this demand, I do not know*") to mean that time could be polychronical and be described by its manifestations. Using *temporalities*, we refer to "*character of what is in time and time consciousness[3]*" (and to social sciences definition of temporalities as collective frames providing common marks for persons and groups which could be plural depending on activities (Dubar & Rolle, 2008)., *Rhythm* introduces the notion of the speed at which the phenomenon takes place. Finally, *temporal regime* could be defined as a set of institutions, procedures and collective actions materializing temporalities organization and use.

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[1] *www.oxforddictionaries.com/*
[2] *www.collinsdictionary.com/*
[3] http://www.cnrtl.fr/lexicographie/

On the long run, temporalities and times regimes have always been in public transport firms strategic DNA since their creation in 19th century (Caron, 2010). Since then, railway companies, later transport and mobility firms, have played a role of prescriber of societal temporal organization, fully in the 19th century or partly during the 20th and 21th centuries. Those firms developed times design capabilities that drive them to regularly adapt their internal organization. Even if public transport is not rated as the most innovative, time-oriented innovation motivation does exist in transport sector beyond classic topics like sustainability, policy-making, Information and Communication Technologies (ICTs) or recently in low-cost systems (Klasing Chen & al., 2014).

First, this research aims to increase the understanding of how transportation firms act as major time operator. Second, we want to open up new horizons for social sciences research works on social times, temporalities, times in the city referring to transport but take for granted transport firms and their evolution. Indeed, previous purposes of scholars were to show new conceptual dimensions of time related to places for architects-urbanists (Bonfiglioli, 1997a, 1997b, Henckel, 2013), to moving space for geographers (Cresswell, 2006), to social times (Boulin & Muckenberger, 2002; Henckel, 2013), to socio-economic choices (Ascher & Godard, 2003) or to mobility as a generic sociological object (Urry, 2000; Sheller & Urry, 2006). These works mostly originated from academic disciplines based on founding dualism between actor and system with encompassing structuring principle: society / group for sociology, space for geographers, utilitarism for economists, place / city for architects-urbanists in time studies. That epistemological posture drives to underestimate firm and its action consequences.

We don't want to say that "firm" is a hidden dimension of times studies, because it's not. Rather, this paper aims to investigate the postulate that integrating strategic and organizational could open on new ways to better understand city temporalities structuration. By structuration, we mean, at least, elaboration and management of social times by inhabitants and technical times by transport firms. These times could conceptually be seen as different but are made of temporalities and rhythms that are often mixed.

GLOBAL TIMES FACTORY: THREE LAYERS OF TEMPORAL REGIMES

During quite two centuries, temporal landscape has been transformed by industrial revolutions. In figure below from (Karlson et al, 2005), six waves of innovation in technological industries can be seen, always shorter and faster, which contributed to produce specific temporality and rhythm.
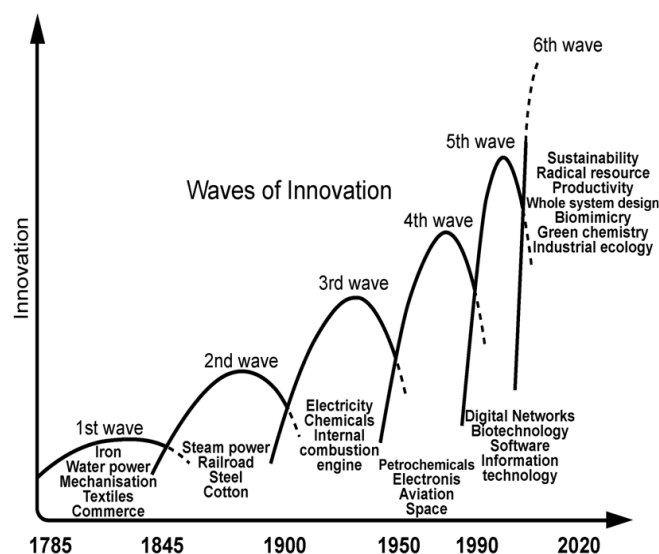
Source : Karlson Charlie Hargroves and Michael Harrison Smith, 2005,
The Natural Advantage of Nations, London: Earthscan Publications

Figure 1 : Waves of innovation on the long run

In short, for present paper purpose, we focus on transport means industrialization evolutions over history to illustrate how technical and times dimensions are intertwined, each one structuring the other. Since railway origin with steam power use until today with pervasive computing, times questions were about transport system able to meet travel expectations.

In our view, three main periods could be identified in times manufacturing by transport sector. First, a *hardware period* (1830-1980) of railway, then transport, temporal regime based on industry (steam and electricity, steel, telecommunications) and land planning at national level (transport networks). Then, a *software period* was added at previous one (1980-2005), with new temporal regimes based on new mobility demands from new urban rhythms of individuals and cities that force transportation to adapt. Last period, since 2000, could be called *everyware period*[4] (Greenfield, 2006) to highlight disruptive temporal regimes related to major societal mutation with social networking and smartphones irruption, so some transport end-users are no more passive.

Even if these three periods have produced specific results, they are to be thought as complementary temporal layers of late modernity (Giddens, 1991), each layer being added to others without replacing them. In other words, actually, we have intertwined features inherited of each layer so, before going to describe, a brief description of these temporal layers.

Table below gives overview of theoretical model we'll develop now using inputs from transport research.

Times regime Dimensions	**Prescription (from 1820)**	**Concordances/ shares (from 1980)**	**Intensive innovation (from 2005)**
Times vision	**Unification** *Railway time as unifying time → GMT (1884)*	**Synchronization** *Urban temporalities defragmentation*	**Generation** *Temporalities & rhythms (re-) generation*
Organizing Principle	Measuring time	Harmonizing existing times	Conceiving new times
Iconic examples	Railway hour Watch and transport graphic	Accessibility to city and services Times offices	Smartphones (trip planners) Social networks
Actors	Railway/ Transport operators *Passive users (passenger)*	Transport/mobility operators *Semi-active users (chrono-sapiens)*	Mobilities ecosystems *Active users (homo mobilis 2.0)*
Times manufacturing based on	**Hardware building** - Railway network building - Land planning	**Software development** - Transport operators web apps - Social times (re-) organization	**Everyware extension** - Navigation Apps - Societal innovative partnerships

Table 1: Theoretical framework of times regimes design

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[4] Greenfield (2006) built notion of everyware replacing suffix « where » in everywhere by « ware » (prefix of ware-house) both to have a semantic continuity « hardware-sofware-everyware » and mean that information is available everywhere with easy mobile access to data warehouses.

Times prescription by railway & transport: a hardware period (1830-1980)

Disruption that affects contemporary temporal regimes doesn't come from nowhere but has been preceded by a greater change in the nineteen century with emergence of "railway hour" (Schivelbusch, 1990). For some, like Charles Dickens - « Even clocks adapt to railway time, as if sun have given up » (*Dombey & son*, 1848) - and Rudyard Kipling- "transportation is civilization" (*With the night mail*, 1905)-, Railway has re-invented time and it was a civilizational mutation carried, and completely driven, by railway companies. Users were only passengers in a passive mode in so far as railway companies created first ever complete artificial socio-technical world (Caron, 2010) for people to feel comfortable and safe during trip time (Schivelbusch, 1990). In others words, passengers used transport under railway pre-defined rules for efficiency and safety reasons.

All transport firms have a long and special relation with time, particularly railway which has invented "unified time" for strategic, organizational and management purposes. "Railway time", created for technical reasons became quickly an asset for transportation firms based on a vision of "unified time" (Sergot & al. 2012), a pure *temporal regime* that replace societal and religious local times. That global change was radical innovation in terms of management science- railway operations and development drove to Railway Big Companies creation, typical of industrialization in 19th century- and society organization- "railway hour" changed.

In a broader view, Industrial Revolution was an historical discontinuity and Railway institutionalization was part of that Modernity new era (Caron, 2010). Major features of Modernity are time-space progressive separation and recombination in relation to individual- collective activity, and growing importance of institutions, as "rationalized" organization, particularly "organizations" like railway companies, to cope with social systems disembedding based on presence-absence of actors : "*modern organizations are able to connect the local and the global in ways, which is a constitution of modernity, doing routinely affect the lives of many people*" (Giddens, 1991). Diffusion of Railway time regime and specific organization (calculation by specific clock, timetables, time-keeper role in stations) are part of a global system of trust, or public confidence, in the capacity of operators to master technical system (Giddens, 1991).

Industrialization with steam power, then electrification gave initial decisive impulse to engineer new machines like locomotive whose success permitted to develop quickly transportation network. Railway impressive development was also disruptive due to its ability to create innovative technical systems pushing innovation in communications sector for operations and safety control (avoid colliding) that make possible train average speed increase. For example, before needle telegraph "free track" signaling (1838), then "time block[5]" (1848) and telephone "block" management (1885), safety was made by signalmen on horses preceding trains, then watchmen or flagmen besides tracks with red flags (1832) and on-board lightmen[6] (1837). Advent of telegraph and telephone in railway operations allows dissemination of any timetable changes, known as "train orders", and, quickly, increasing of service offering. That "time control system" was implemented due to development of accurate and reliable clocks or synchronized watches (Ball Watches, 1891)

First focused on operations regulation, "Railway time" power as Society organizing principle became so evident as timeframe for people and cities with consequences on urban and land planning : stations became major landmarks and the creation of several French "railway cities" (Deauville, Cannes, Arcachon,…) re-structured the national space (Ribeill, 1993). Indeed, in 1840, British Railway Companies introduced "railway hour" as a reference to simplify transportation for users and master technical operations, followed by France and all countries. After that, all railway lines were ruled by

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[5] Block
[6] "lampiste" in French which became an usual expression meaning someone, with a low status in the organization, who will pay for a failure

same hour based on official hour of line ending point (terminus) and, in France, it was Paris' hour (Baillau, 2006). But, even if "railway hour" was invented for operations management needs, railway time stayed national for some decades. In Geneva, until 1886, three different railway times were used to fit with Bern, Paris and Geneva destination local hours. More, local times didn't disappear and during few decades cities and railway times co-existed. In 1884, at Washington conference Greenwich was chosen as origin, so all world time zones were defined according to that "Meridian Zero" and GMT (Greenwich Mean Time) adopted all-around the world. According to that strategic choice, transportation firm organizational design became a requirement to develop railway timetables and optimization, so "to obtain that trip regularity, every mechanic [*driver*] is provided of a time-keeper by Administration" (Clarke, 1839). Managerially, "time-keeping" was a real role for skilled person in charge of verifying time precision and giving, every day, official time to operations employees (Ribeill, 1993).

On another side, Railway transport has invented time usages during trips with first Library inside stations to sell books and newspapers by WHS Smith in 1848 and quickly, on-board services (Dodds, 1952). In a word, during second half of 19th, railway rise was fast and refers to three main features: panoramic mobile vision from inside train that changed relation to landscape, new consciousness of space-time that opened on new vision of countries and new activities like trip reading that transformed relation to mobility (Schivelbusch, 1990).

These operational advances were the conceptual baseline for railway development, and others transport means, during one century. Transport systems were quite aligned with society needs as shown by abundant literature and films. Strategic frontier was more about land planning, network development than time organization as higher speed quest was only technical matter. But, after one century of transportation development (networks, land planning), transport companies were challenged by seventies' societal changes. Railway technical temporal regime had to adapt to social times mutations, which put under pressure at least work-life balance and city organization. For example, in big cities, morning-evening traffic peaks are less visible due to services economy extension with fluctuating work schedules plus continuous workday day and personal times development with evening mobility demand to go back home after restaurant and cinema or children post-school activities (Bailly & Heurgon 2001).

For long, private car absorbed these changes, but with growing road congestion, transport operators thought that they could help people managing own individual and collective times for better concordance and harmonization.

Times concordances and shares: a software period (1980- 2005)

After more than one century during which railway was times prescriber along with private car (from 1950) and social times were punctuated by industrial temporal regime (regular hours), temporalities fragmentation occurred. Some transport operators decided to engage a prospective process to understand societal mutations and to feed strategic thinking. We propose to call that sequence, the "software period" (1980-2005) to underline transport firm progressive understanding that strategic goal was to find ways to adapt heavy system of railway production to times plurality: "city is polychronical" (Lefevre, 1981). Like in computing in the eighties (Gawer & Cusumano, 2002), challenge was to move from pure hardware to software introducing some smartness in a rigid system to help city and individual about times concordance.

Taking into account mobility individual level was a breakthrough for transport operators, which saw themselves as industrial producers of trips. That mutation was very progressive according to transport operators capability to accept differentiated practices and behaviors from users and to introduce some smartness in mass transit operations (Heurgon & Laousse, 2004). More considered as persons with marketing rising in eighties, users were associated to "trip production" in a semi-active mode. Here, "semi-active" means that transport technical system was still pregnant but needs users specific

behaviors to be efficient like chrono-sapiens (Laousse, 2004). For example, degraded situation information and official transport operators web apps were designed to frame behaviors during trip, particularly user massive flows at peak hours.

Re-discovering mobility

Back in the eighties, societal mutation about mobility took time to emerge as a structural, and not cyclical, change even if public transportation firms have to answer to strategic questions based on new users demands (Rosanvallon, 1986). They have to adapt to a paradigmatic breakthrough entitled "from transport to mobility" in which the nature of time organization has changed from technical railway time to user times/ times in the city (Ascher & Godard, 2003; Allemand & al., 2004; Vodoz & al., 2004; Amar, 2010). In both situations, transport firms participate to design but in the second phase, it was more a joint design with users. We are still in that last period of changing urban rhythms.

In short, around 1980, some practitioners from inside transport firms feels that transport has to change and transport companies have to adapt to a major mutation they suspect structural. Under that premise, an open seminar mixing scholars and practitioners was carried in 1982 by RATP top management "to prepare transport sector for adaptation by the year 2000 with a focus on research contributions to strategy" (Guiyesse & Le Goff, 1986). To be consistent with both openness purpose to scholars and practitioners and to strategic contribution, a specific prospective process was designed by urban transport operator (RATP) and co-chaired with academics (J. Le Goff, historian & M. Roncayolo, geographer). During "5 years of continuous seminar" main intent was to understand societal transformations in the "long time" of history and space-time changes with geography tools and, broadly, with social sciences input in transport technical world (Caron, 2010). That original seminar led to Prospective permanent team creation, first called "Network 2000", to develop action-research projects.

From the beginning, it was a conceptual prospective focused on wondering about research capability to explain mutations and to reveal alternative ways of acting and public decision-making (Heurgon & Landrieu, 2000). That conceptual prospective differs from classic scenario planning (Godet, 2001) and foresight for innovation (Andersen & Andersen, 2014) in the sense that future is more seen as wishable- thus buildable- than predictable (Heurgon & Landrieu, 2000). To do so, new knowledge is needed to elaborate original points of view with most accurate research. That knowledge for prospective, even practical or academics, couldn't pre-existing data to find and use but something to reflexively fabricate in the course of action (Gaudin & Hatchuel, 2002). More, facing a moving target like "mobility enaction", prospective approach was probably wiser to keep scenarios scope open to take into account hidden dimensions of topic under investigation (Kunseler, 2015). So, working on prospective of transport futures in city and urban area, several conceptual breakthroughs occurred which change the way transport firms define themselves and their potential of action (Guiyesse & Le Goff, 1986). Among others, we'll present three of these breakthroughs which are more related to our question of new time regimes.

First, considering cross-influences between daily activities temporalities and transport operations rhythms, transport has to be considered as a « time-box » where one could have activities more than spatial interval: "*trip is a transition time with specific temporalities*" (Bonnet, 1986). For example, to describe a trip, people give a duration (I'm at 30 min- home) instead of a distance (I'm at 20 km from home). Second point, bring out time structure of trips opens on new representations like isochronic maps (space-time anamorphosis) because "*since 1830, innovations in transportation and information technologies followed one another by imposing new visions of space, put in perspective by the duration of travel*" (Bretagnolle, 2005). Last remark, changing technical and economical vision of transport by introducing concept of "mobility". The challenge was to take into account individuals (Le Goff, 1986) and urban access to city-space and services in a strategic perspective of redefining Public Good and transport public service (Cohen, Hatchuel, Amar, 1991).

Even if original intent was to introduce social and management sciences into very technical world of transportation, contributions to strategy, R&D and marketing were significant. For example, field

surveys on social times-related user behaviors (work, leisure, domestic activities) and transport adaptations permitted to introduce the figure of end-user as a person.

From transport to mobility: prospective of new urban rhythms

Questions arose in contemporary transport operation about social times concordance related, at least, to three converging mutations. First mutation, new individual expectations like leisure and access to city amenities and services induced increased need for transport but in atypical hours (off peak, night, week-end) for leisure. According to INSEE (national statistical service), in one generation from 1974 to 2001, we have seen leisure like going to restaurant or cinema increased by 25% and mobility as well. Trips were less predictable with diffuse and random mobility uses that required to change transportation rhythms (Bailly, 2002; Heurgon & Laousse, 2004). Next mutation was about work transformation in a services economy with less regular hours because of dual effect of industrial sector decreasing –services increasing. Work intensification plus social times diversification- leisure, but also domestic and family activities- have resulted in a deep transformation of times code (Laousse, 2007). Finally, facing fast growing urbanization, city times structure couldn't be the same and, in an expansive city, daily topic for inhabitants was more temporal sprawl than urban (spatial) sprawl (Bailly, 2002).

All of these produced mutations of city uses and correlated temporal regime transformation with de-synchronization of individual temporalities and collective social times. Usual collective times regulation out of order so, new urban rhythms rising drove transport firms to engage in a strategic thinking process or, at least, to test robustness of existing strategy (Bailly, 2002).

Long synchronized by work and school, and heirs of national land planning policy, transportation always tended to favor relationship to space, regarding time as a dependent and measurable parameter. However, transformation of daily life rhythms was characterized by de-synchronizations that changed mobility practices and raises new problems for urban management and transport organization. More complex and random, these new temporal regimes emphasize individualized solutions with fragmented and overlap life times. Daily time individualization appears both as a product and as operator of these societal changes. Mobility becomes more diffuse in space with urban sprawl, in time with the changing daily rhythms and temporal sprawl. For some, fragmented temporal regimes could be a source of societal fragmentation (Vodoz & al. 2004; Ascher & al. 2004; Laousse, 2007).

Transportation profession has to change strategic vision softening hardware development (traffic-network) by a mix between regulation and services. In their capacity of rhythms prescriber, as seen earlier in hardware period, public transport could be a powerful tool to regulate collective rhythms but could be limited facing individual rhythms variety. Indeed, rising complexity of practices and behaviors called for new ways to regulate these "zigzagant mobilities" (Bailly & Heurgon, 2000) and offer end-users "temporal damper" services (Bailly, 2002; Hervé, 2002). By zigzagant mobilities, these authors meant non-linear practices based on spatiotemporal compromises between intermediate destinations (going from A to C to A' to B), divergent from classic commuters behaviors (going from A to B or home to work). Thus, individual de-synchronization became quite a standard with local and personal temporal regimes, differentiated by social situation, gender, generation and territories with "at individual level, a rationalization of [personal] times and, at relational level, a regime of continuous availability" (Bailly, 2002). A "temporal damper" appeared: all services to individual and families to help them accommodating to temporal daily pressure, particularly women who are often in the front-line of families (Hervé, 2002) as day-night nurseries possibly integrated with food drive-in, home services, … But, even if these services existed before, scalability was a real problem to meet increasing demand in the absence of established economical actors at that time (Bailly, 2002).

These developments lead therefore to grasp mobility on an extended conceptual basis: there is no longer, on one side, Space and, on the other, Time, but urban life (plurals) time-spaces. For transport operators, challenge is to create, at the same time, new tools for physical (moving), social (accessing) and virtual trip (navigating). In other words "being mobile is a kind of chrono-sapience [wisdom], a contextual intelligence of movement… and steps of immobility, all combining physical and virtual trip"

(Laousse, 2004). In others words, *Chrono-sapiens* figure highlights the learning process to be mobile combining himself contextual times heterogeneous resources especially signage that was, at that time, mainly spatial.

Mobility and time urbanism

Other important trend of temporal research was made by architects and urbanists about times policies and associated times offices with the intent to define mobility and time urbanism as a new academic discipline (Bonfiglioli, 1997). The concept of chronotope (place occupation variation according to activity-moment-user matrix) they develop was materialized by space-time structure dynamic visualization with chronotopic maps (Bonfiglioli, 1997a, 1997b; Guez, A. 2002; Laousse & al., 2002). Chronotopic maps aim to build a shared vision of territory architecture characterized by its dominant hour regime.

Since then, an academic movement based on a renewed political view of city future and called "times in the city" had aroused. It puts a clear focus on mobility as input for time urbanism in Western Europe (Henckel et al., 2013). In short, work done on mobile citizens and city temporalities has consisted primarily of social times and public sector case studies on attempts to deal with time constraints. While the number of papers developing and making use of "time of the city" theory has been constant since last two decades, important issues have been addressed to characterized new time regimes: (1) social times are an object of public policy, (2) mobility and time urbanism provides visualization of cities temporalities useful for local negotiations about time organization, (3) mobility redefine society and time-space relations.

These time-mobility studies have suggested benefits of time policies for urban planning and temporalities concordance, but also limitations and even downsides to overreliance on social time studies. Indeed, even if times in the city was of great academic interest to understand social times coordination and concordance (Boulin, 2008), the very novel nature of temporal regimes in mobile societies was underestimated by social research. City temporalities were taken for granted, a "social fact" to elucidate and deconstruct whereas these temporalities returns to collective action (Hatchuel, 2012). Following that view, individual and city temporalities are *designable* and *actionable* by users and by firms producing time services like transport and mobility operators during collective learning processes. More, Hatchuel postulates "collective action requires knowledge and relations to be constructed to make it possible" (Hatchuel, 2012). Transport operators develop knowledge about mobilities rhythms & relations with users and other actors that change their mindset on the long run.

Mobility-turn in social sciences

In parallel to these pioneering prospective works, social research went on in two directions: sociology and geography. Main trend was about emergence of new mobilities paradigm in social theory around mobility-turn motto in sociology (Urry, 2000; Sheller et al., 2006) and then in geography (Cresswell, 2006). Urry (2000) produced a "manifesto for a sociology that examines the diverse mobilities of peoples, objects, images, information and wastes; and of the complex interdependencies between, and social consequences of, these diverse mobilities." New mobilities paradigm questioned disembodiment of social sciences principles like "group and society" for sociology and "space" for geography that drive scholars to neglect goods, information and people mobility. Since then, these scholars are working on "mobile sociology" as a new way of social research based on presence-absence relations (Sheller & Urry., 2006), (im)mobility and moorings (Cresswell, 2006) and "governmobility to suggest that societies are increasingly governed through mobility" (Bærenholdt, 2013). They proposed *mobile methods* that are "on the move (…) to "enable new forms of sociological enquiry, explanation and engagement" (…) of mobilities that produce social life" and mainly based on mobile ethnography and participatory design to accompany projects (Büscher & Urry, 2009). But, even if that new social theory is more about engagement in innovative projects than critique, it lacks a theory of innovation to understand design activities.

Times intensive innovation: an everyware period (2005-…)

Actually, transportation sector is in an *everyware period* of ubiquitous computing (Greenfield, 2006) at a global scale with smartphone that foster social networking mobile web[7]. Year 2005 opened that new period with first personal Transit Trip Planner by Google which was first attempt to challenge Public Transport Operator monopole on daily times planning. After that, with Facebook and iPhone, new generation of personal and social urban navigation mobile devices appears that developed transit trip planners as mobility incentive vectors as well as ways to organize it, inventing own temporal regime. It was part of a broader process of daily times mastering and designing to be compared to other times planning tools rapid dissemination, like for example "To do list" Apps. With own mobile device for time planning, chrono-sapiens became *Homo mobilis 2.0* to symbolize that he has access to mobile apps and data from other social networker to organize mobility and to make recommendation on trip quality (Mitchell & Casalegno, 2005; Laousse, 2008; Amar, 2010). Users engaged in an "active mode" of being travelers in search of autonomy and, for some, to design their own mobility individually and collectively.

For transport operators, usages mutation was for long a major prospective topic waiting for strategic validation prior to develop innovative design on new mobilities (Amar, 2010). Strategic integration occurred when mobility could be rendered in management terms. Before that, mobility was a prospective and academic research question searching for strategic space. Mainly, shift was an outcome of individual user expectations (autonomous mobility, useful trip time) and cycle end for transport and land planning (funding scarcity, space saturation). In other words, perceived need to go beyond pure "paying client" marketing view towards mobile person and search of new growth drivers transport operator were inputs to adapt strategy.

On that basis of mobility instead of only transport, two conceptual moves were made possible that change services strategy, particularly mobility services, in potential scope and actors to mobilize. First move relied on changing references from "city" to "urban space" (Guiyesse & Le Goff, 1986; Allemand & al. 2004; Heurgon & Laousse, 2004). City temporalities could be assimilated to spatial limits and political organization in which temporalities are negotiated, more or less in a top-down way. Here, working on city temporalities means looking after time convergence and concordance during round-tables ruled by public authority (Bonfiglioli, 1997a, 1997b; Boulin & Muckenberger, 2002; Henckel, 2013). Urban space temporalities are associated to territorial device and societal project, "*spaces thus take value, and meaning, only through [this] time play*" (Roncayolo, 2002). Urban space temporalities looks like an open time-space where relations occur, like urbanity (city membership) and civility (social distance), more on a bottom-up way (Heurgon & Landrieu, 2000).

Second move focused on action ecosystem and actors relations, including firms whose understanding of situation could drive to services creation of any kind. Urban actors became stakeholders involved as temporalities active designers producing individual and collective rhythms additional to transportation technical times (Laousse, 2008 & 2010). And, it's not only a (re)combination of existing temporalities but full innovation. Mobility identity changed, based on new urban mobile rhythms that transform relation to mobility which become a "way of life" for some who master times code (Laousse, 2007).

For others, mobility could be a societal injunction (being mobile to be included) and a way to social exclusion. More, Rosa's work on times acceleration social critique showed that temporal regimes mutation could increase exclusion (Rosa, 2010). Rosa distinguishes three kinds of acceleration-personal experience, technical rhythms and social change- whose convergence could invalidate existing capabilities. But, these societal could also be opportunities for people to innovate in terms of practices and behaviors and for firms to offer innovative services. "While transportation engineers

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[7] Icons of everyware period are Facebook (created in 2006) and iPhone (2007)

reasoned in terms of speed and security, seeking to shorten "lost times", mobility experts were more interested in mobile time richness (…) reliance and urbanity . Who are these mobility experts? These are not engineers or even urban planners and sociologists, but each of them. Because mobility has become a social skill, an art of living. And that *ars mobilis* is invented partly in (…) the hybridization of transportation tools with digital" (Amar, 2014).

To resume briefly that section, transport operators and mobility users are linked by temporal relations based on three main times regimes layers. These layers support differentiated temporalities and rhythms based on technical and social change innovative dynamic. Management science could be useful to better understand public transport firm action on these contemporary societal transformations, particularly their innovative dimension.

WHY MANAGEMENT AND DESIGN SCIENCE IN TIMES STUDIES?

As seen previously in this paper, usual times studies concentrate more on describing situations without giving full importance to temporal layers tailored since early 19th by railway and Public Transport companies. So, they underestimate transport firm organization and management consequences. For social sciences (i.e. sociology and geography), new mobility paradigm is more about society and people, for time architecture- urbanism, temporal regimes refers to dynamic societal negotiation and urban projects. For transport operator mainstream, times studies use to be seen as socio-technical matter that match operations and demand.

We propose to complete these visions by putting in the debate on temporal regime production firms organizing role. We'll insist on three main dimensions: modern global organizational process, times management as collective action requirement and design object.

Organization as a major consequence of modernity

First intent, highlighting importance of "organization" in modern times regulation (Giddens, 1991). According to Giddens definition of modernity, rationalization process is a feature of modernity, others are time-space separation and generalized reflexivity. Rationalization process main manifestation is "organization creation" in every domain (politics, industry, civil society) since second industrial revolution in early 19th century. For Giddens (1991), we are in "late or radical modernity" period, a radicalized modernity where features like "organization" are reinforced.

This is an important point for our research work whose global aim is better understanding of industrial processes influence on time regime constitution and to be more specific, temporalities and rhythm management and innovation by railway companies since early 19th century (Caron, 2010). In that, we postulate that railway companies, then called transport firms, were and are a major actor of temporal regimes elaboration and dynamic. Obviously, societal context has changed since railway companies imposing technical time to society, but actual transport firms are still actors of new temporal regimes elaboration.

Deeply related to societal context and to economical evolution speed, public transport firms are not only Weber's (quoted in Clegg & Baumeler, 2010) iron cages creating internal bureaucracy, but also refers to more malleable forms. Following Bauman's (quoted in Clegg & Baumeler, 2010) contribution to debate on late modernity with "liquid modernity", transport firms have a problem of adaptation speed to be in phase with societal evolution: "*Transience has replaced durability. (…) We live in a society in which the conditions under which its members act change faster than it takes the ways of acting to consolidate into habits and routines*", ibid.. So, an open question arises on how to develop something useful (service or product) in an ever-faster changing context? Or, for times studies, how new temporal regimes could be developed if it's quite impossible to stabilize them?

In our view, transport/ mobility evolutions are tightly related to these three visions of modernity : hardware dimension pertains to industrial modernity, software to late modernity and everyware to liquid modernity. More, transport/mobility firms have to manage differently during each modernity form to be in line with societal mutations. In the words of Giddens (1991), that means creating "organizations" for each societal mutation: big companies for technical and land planning development, open firm to cope with users' new demands and ecosystemic firm for collaborative innovation. But, Bauman's point on versatile structuration (i.e. liquid modernity) has to be taken in charge by firms and actors when engaging in action, as a governance rule of times evanescence.

Rules of collective action governance

Second purpose, we have seen previously that understanding city temporalities is also understanding public transport firms role in times regime elaboration. That role isn't only managing operations technical rhythms according to city temporalities. It's, at least, to develop sensors to better understand societal situation, convert it into managerial terms for smarter decision-making and then find ways to mediate internal organization and societal relations. From now on, in a troubled period of societal transition from ruled-based competitive and private actors relations to open, highly mutable and collaborative, networks of actors, many firms reconsider deeply their way of acting.

Contingency theory highlighted reciprocal structuration between organization and environment (Burns and Stalker, 1971; Lawrence and Lorsch, 1989) extended by recent work on innovative collaborative processes for exploratory partnerships (Segrestin, 2006) instead of usual client-provider relations. As we'll see further, when public transport firms talk about becoming mobility operators attentive to all temporalities instead of transport operators focused on city and technical temporalities, it could be understood as new relations with new actors: *"a way of sharing with others and inviting their participation"* (Chesbrough, 2011). But, that openness could be contradictory with usual sectorial and divisional organizations that reduce firm agility capabilities.

For transport operators, adapting to changing actors ecosystem with more and more demanding end-users, firms and new players that want to be listened and have a say on transport and mobility times-related evolution isn't so easy. It's something important for their daily life and economic activity but not obvious to integrate new actors in a codified world like transport based on contractual relations between transport authority and operators. Opening transport world to new values of mobility- new meanings of mobility (Allemand & al., 2004), mobile and connected persons (Amar, 2010), recognizing variety and diversity of hyperurban rhythms (Laousse, 2009)- results in new players to join. That leads to a mobility-turn is occurring in management sciences in considering links between mobility and organizational dynamics (Sergot & al., 2012) or kinetic elite (Costas, 2013). Main difference with mobility-turn in sociology (Urry, 2000) or geography (Cresswell, 2006) is that it's more a way of action than description and analysis.

In that perspective, management science' view of collective action could be helpful to better understand actors ecosystem dynamic. Indeed, collective action is a founding topic for management science based on knowledge and relations elaborated by firm that make it possible and firm could be defined as "*an artifact of collective action*" endowed with strategic capabilities (Hatchuel, 2012). Thus, it's the only "institution" able to define itself what it will do and to modify itself developing new knowledge and relations to continue to act meaningfully (Bréchet, 2009). Applied to times-related actions, that means public transport firms unfold, over times, capabilities to elaborate continuously specific knowledge (sociological, societal, technical, economical,…) and relations (actors ecosystem) to manage societaltemporalities and their rhythms by proposing new services or adapting existing ones.

Every organization makes such strategic choices in a contingent mode developing its own capabilities to cope with societal changes. Long history of transport firms show that their executive managers change regularly their mind about knowledge-relations couple. Industrial period, building hardware,

saw them concentrating on acquiring technical knowledge (train, tracks, signaling, civil engineering,…) and developing closed relations with State decision-makers. Second period was more focused on opening new and reciprocal channels with users' representatives to integrate their concern in strategy based on new vision of urban mobility. Last period, design projects requires divergent knowledge and new relations, sometimes with unusual actors (citizens-non users of transport, local firms,…).

In that, we could see that collective action is an ever changing process that requires strategic agility from firm to be able to switch from operations to change. Defining strategy as based on *dynamic capabilities* highlights strategy blending side in search for balance between exploitation by existing process regulation and innovation by opening new strategic fields as quoted by Teece (2014) in a 24 years of research synthesis: "*dynamic capabilities are adapting, orchestrating and innovating, so* doing right things*, at the right time, with the right New Product Development, unique managerial processes, strong and organizational change-oriented culture and a prescient assessment of business and technical opportunities*". For Teece (2014), dynamic differs from ordinary capabilities based on "*efficiency and* doing things right *(administration, operations, governance)*".

Teece' research shows that strategic change requires previously dynamic capabilities transformation based on dual process of learning and environment scanning. Scanning drives some firms to new innovation sources awareness and to find inspiration in unexpected places, for example social sector (Kanter, 1999). That raises strategic questions about fitting with societal mutations knowing that engaging in an adaptive path could produce "*an immediate increase in the likelihood of additional changes of the same type*" (Amburgey, 1990).

Convergence of stakeholder network expansion and openness to diversity of point of views resulted in "prospective of the present*",* a new way of thinking and acting collectively on futures to make strategic contribution for transport operators and to feed public debate about mobility-transport couplings (Heurgon & Landrieu, 2000, Bailly, 2002; Heurgon & Laousse, 2004). Prospective of the present is quite different from usual scenario foresight in that the later is based on evolution trends (Godet, 2001) and the former on futures conceptual building (Heurgon & Landrieu, 2000). Notion of "weak signals" are used differently: in search for thresholds for scenario foresight and alternative way of action, even tiny, for prospective of the present. Prospective of the present approach requires project managers to be reflective futures practitioners able "*to balance between salience, credibility and legitimacy while generating knowledge in interaction with policy-makers and other social actors*" (Kunseler & al., 2015).

Here, management science contribution to times studies was to insist on collective action pattern underlying strategic and organizational choices. In next section, we'll concentrate on temporal regimes as an innovative object.

Temporal intensive innovation design

As said previously, most of research works related to times studies focus on temporal regimes as a result of society or social times (sociology), travel space-time (geographers), labor market or services economy (economics), city (architects-urbanists). City temporalities and rhythms are more seen as assemblies between all city timeframes or negotiation between actors than individual and collective creativity. Since beginning of railway, times and temporal regimes have been a consistent innovation field even if it's often hidden by tropism on iconic objects like train and by daily temporalities and rhythms people endured, particularly in transport peak hours.

Our contribution will be to shed light on the innovative nature of times not to underestimate times regime "conceptive" and "generative" dimensions. As seen previously, "conceptive" means considering times as a design object and "generative" refers to capability to produce newness due to exploring usagess and to some usages generative goods, Apple's iPad for example (Brown, 2013). By analogy, city actors (habitants, city managers, local communities, transport operators,…) creates and re-creates temporalities and rhythms to perform daily life activities.

Integrating design paradigm in the field of times studies pinpoint that, since 19th century, modern times have been designed as organizational objects by railway companies. Temporal regime elaboration could be seen as collaborative innovation, and sometimes disruptive innovation (Christensen & al., 2006) that opens way for related-innovations. For Christensen et al. (2006), "*catalytic innovations are a subset of disruptive innovations* " carried and driven by « catalytic innovators » who develop abilities for creativity and develop supporting ecosystem of relations. Catalytic innovations provide « ability to influence system-changing solutions (…) to create systemic social change through scaling and replication » (Gundry et al., 2011). ICTs play more and more that role of catalytic innovation. Quite ten years after disruptive societal innovation made by social networking and smartphone[8] , one speak now of "GAFA", an acronym for "Google-Apple-Facebook-Amazon" meaning that these companies are giving "tempo" to everything from cities, to firms and people. Temporal regimes innovation by transportation sector could be a disruptive and catalytic innovation example of that kind when analyzing ICTs impact on people daily life mastering and on cities and transport organization.

Innovation isn't sudden inspiration flash, but based on specific innovation regime, characterized by "*three dimensions: specific design reasoning, collective organization type and performance logic*" (Le Masson, Weil, Hatchuel, 2014). According to these authors, innovation regime is, by the way, specific to an historical era and "*each of great industrial revolutions was linked to new forms of innovation, either in content, functions or organizations*" and, as "*Innovation is now intensive (…) These wide-reaching changes can be expressed by a simple formula: the transition from R&D to RID. The new "I" between research and development refers to the functions and competencies of innovative design. [Such] (…) innovative design activities are not only exploratory but activate, throughout the firm, an innovation-oriented metabolism*" (Le Masson, Weil, Hatchuel, 2010). Thus, in some ways, public transport firms could be seen as representatives of that innovation regime with constitution of design offices (19th), prospective (20th) and innovative design teams (21th).

That innovation regime refers to practices that were modeled and theorized through C-K theory (Hatchuel and Weil, 209), a theory of design reasoning that distinguishes Concept and Knowledge generation "to highlight the reasoning behind innovative design activities and their organization" (Le Masson, Weil & Hatchuel, 2010). Baseline is that only a dual expansion of two spaces of concepts and knowledge could drive to discoveries and learnings, potentially innovative and valuable. Disruptive innovation occurs when during that during exploration process "object identity is revised" (Le Masson, Weil, Hatchuel, 2010), for example what is the identity of iPhone: phone? Smartphone? Apps warehouse? We'll see further how invention of "railway hour" has changed identity of object "times", from religious and solar time, in the world during 19th century.

For practical reasons, an innovative reasoning process based on a "linear approximation" has been developed for industrial sectors: KCP Workshop (Knowledge-Concept-Proposals) to "*avoid fixation effects*", "*orphan innovation*" (expert task force) and "*consensus without breakthrough*" (creative group management). KCP was organized since then in three phases: "*K-phase to create common knowledge base*" and language; C-phase to "*generate concepts in a guided way*" and P-phase to "*structure an agenda of action*" (Hatchuel & al., 2013). That innovative design process plays on two complementary dimensions, one cognitive to explore new object identity creating new knowledge and one social to explore collectively. First occurrence of KCP Workshop was in urban transport in 2003 to prepare disruptive innovation on bus systems inspired by Underground or "surface subway" (Laousse, 2008). KCP workshop gave us a powerful collaborative process to fit with the unknown irreducible nature of emerging temporal regimes in contemporary mobile societies. With the two KCP workshops that will be described later, our question was mainly concentrated on how mobile society and urban actors (people, operators, decision-makers,…) and cities frames daily temporalities of each other, in very unexpected ways that requires innovative product and services design ?

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[8] Facebook born in 2006 and iPhone in2007

In the following section, we propose an overview of temporal regime structuration since railway companies' constitution (19th). Then we use this analytical framework to address current times design using two KCP workshops as case-studies.

In next section, after situating conceptually our work according to management science and to temporal regimes three historical layers, we'll concentrate on two case-studies to describe how we get there.

To resume that section, table below gives overview of theoretical model we'll develop now using management science inputs.

Governance Dimensions	Prescription (from 1820)	Concordances/ shares (from 1980)	Intensive inovation (from 2005)
Times vision… (reminder of previous section)	**Unification** *Railway time as unifying time → GMT (1884)*	**Synchronization** *Urban temporalities defragmentation*	**Generation** *Temporalities & rhythms (re-) generation*
… contingent to **modernity forms**	**Industrial modernity** *Socio-technical system rising* *National economic development*	**Late modernity** *Social times recognition* *Societal negotiation at city level*	**Liquid modernity** *Societal innovation all-around* *Dynamic ecosystem partnerships*
… with specific **collective action governance** managing actors to elaborate useful knowledge and relations	**State decision making socio-technical top down process** *Few top level actors* *Railway companies, then Public Transport operators (1935) & State Ministries (transport and urbanism, industry)*	**Mix of local State top-down process & openness to transport users** *… opening to local and users* *Public Transport operators & Local government & transport users associations*	**Local bottom-up decision-making process with mobility actors** *… ecosystem engineering* *Public Transport operators & Local government & transport users & mobility users including non-users citizens & local firms*
…with different **drivers of design capabilities**	**Railway/ transport times design** *Socio-technical projects made by companies internal teams to create timetables*	**Social times concordance design** *Prospective of the present prior to collaborative negotiation with stakeholders to optimize work-life balance (Time offices)*	**Societal times generative design** *Conceptual prospective to engage innovative design with all actors to generate new mobility usages for better urban life (KCP workshops)*

Table 2 : Theoretical framework of times regimes management

METHODOLOGY

The current research relied mainly on intervention-research (Hatchuel & David, 2007; Radaelli, Guerci, Cirella & Shani, 2012) on a longitudinal way in so far as one of author practices design KCP workshops since quite 15 years. Intervention-research shares with Lewin's action-research ambition of "*producing knowledge both academics and useful for action*" in his seminal article Action Research and Minority Problems (Lewin, 1946) Journal of Social Issues, 1946) but differs on learning approach

which is a "collective building dynamics of managerial innovation" with new actors constitution instead of speeches confrontation in a reflexive group for action-research (David & al., 2012).

SpotLAB overview

SpotLABs could be defined as innovative workshops dedicated to find new ways to make open and disruptive innovation. One of the authors of this paper is in charge of organizing and animating "Innovative function" in a major transport company and SpotLABs are one of the devices that team tailored. SpotLAB is managed as a formal collaborative process with local actors and all meetings are planned in neutral places for actors to be equals. Participants were actors from internal operations sector (train-station managers, marketing, local development, ICTs,…) and outside transport group (transport authority and representatives from other public entities like tourism or industry, end-users, local firms, cultural and social associations, scholars,…). Beyond projects, innovative workshop produces synchronization for SpotLAB community as it's not obvious to gather all these actors in the same time-space during at least four months and more if some participate to future projects. Without SpotLAB, divergent views between local actors and transport operator could drive to endless conflicts. In other words, SpotLAB help participants to become real actors and to share futures vision related to projects collective elaboration, and more they share a new culture of mobility.

Usual SpotLAB gathers around 30 to 40 actors for 4 half-days to have group with sufficient size for differentiated visions and experiences. Every SpotLAB have a sponsor, a top level decision-maker to be quite sure that outputs could be implemented. In a word, during workshop, SpotLAB are managed by specific animation team, with local collaboration from transport actors, and transfer to local actors is done when project emerges. More, reciprocal invitations between sessions by participants to present point of view developed during SpotLABs illustrated group vitality.

SpoLAB organization is based on customized process implementation based on innovative design methods elaborated by research team from Mines ParisTech (Hatchuel & al., 2009). With SpotLAB, canonic KCP workshop linear process Knowledge (K)→Concept (C)→Projects (P) (Elmquist & Segrestin, 2009; Hatchuel & al., 2013) was partly interpreted in a parallel manner (KC→C→CK→P) to fit with workshop planification. In that view, Knowledge and Concepts are intertwined for a first stage of pre-conceptualization based on fresh K (Kc), then conceptual opening (C) and deepening with identification of K to find (CK) to prepare project implementation with actors.

First session was focused on creating a SpotLAB community defining collectively working perimeter and first issue set-up after knowledge sharing about concerned territories and generic topics (frugality, societal, digital, mobility and transport) by local scholars and experts. During second session, SpotLAB community work on conceptual projectors elaborated by animators and based on provocative ideas to force sub-groups to avoid fixation effects on previous ideas and give new ideas. In third contextualization session, using session 2 early ideas, animators feed debate with a conceptual tree resuming all possible innovative paths and at the end of each branch concept-project are first visualizations of ideas. Last session is dedicated to deepen conceptual tree with new branches knowing subgroups have to propose an exploration strategy to shape each concept-project proposed.

Two specific and recent case studies are mobilized to investigate how innovative design method supports the development of an original point of view about urban temporalities among stakeholders. Each case study relied on adapted KCP workshops. The workshops were organized in half day four sessions, once a month on the topics of Frug@l mobility (March to June 2014) and Societ@l mobilities (April to September 2014). Forty full participants were involved in Frug@l mobility workshop and thirty-four for Societ@l mobilities workshop. Both projects were named "SpotLAB" to suggest existence of specific temporality (temporal hotSpot) for an innovation place (Lab). In other words, intent was to design KCP workshop as intense "times bubbles" within an innovative design process to manage more accurately group rhythms for social (constituting SpotLAB community) and cognitive purpose

(managing exploration strategy). Two SpotLABs choice was made to compare use of same innovative design workshop methodology in quite parallel sessions and that on similar topics.

SpotLABs presentation

Nowadays, with, on one side, decentralization laws that assigns more power to local authorities (Region, cities) and, on the other side, local actors empowerment, transport operators have to change usual centralized model of innovation. Innovation could no more be delivered from headquarters if new requirement was connecting with local. SpotLABs were an attempt to invent new innovation model based on partnership with local actors, knowing that local actor notion was quite fuzzy with end-users, nearby residents, associations of all kind, firms interested by transport for their employees and to deliver new services, local public institutions, etc.

That situation was quite different from previous ones in railway era- innovation was prerogative of few actors, mostly public- and transport era –innovation in transport was still public actors prerogative with little consultation of users during public debate procedures. Now, innovation is more about being partner, included in an innovative ecosystem, than only actor. In a word, innovation nature has changed from stabilized, linear and top-down mode to a mix of bottom-up and horizontal collaborative actions. So, SpotLAB were designed taking into account these societal transformations.

Frug@l mobilities SpotLAB. Normandy, laboratory of new mobilities (2014)

That workshop occurred in 2 deprived cities in Normandy away from 80 km each. Bernay, an historic city of 13 000 inhabitants whose richness was based on Benedictine Abbey (11th century) knows actually a high level of unemployment (15%) with very low local development potential except tourism. Val-de-Reuil, the last "new town" build in France in the seventies, has 15 000 inhabitants and an unemployment rate of 25% whereas, just nearby city center, thousands of jobs in luxury and chemical industry existed.

These cities are situated in "intermediate spaces" neither rural nor urban, so no specific national policies are tailored for them. They see themselves as out of time but want to be back in the race using stations as local development hubs. For national railway operator, goal was to renew cities stations as interchange hubs situated on important lines but with few trains that stop here. Local and national challenges were so divergent and conflicting between transport and cities actors that they decide to try something different like SpotLAB. It was clear for decision-makers that it's an intervention-research approach and not a consultant proposal.

Considering mobility shed light on two cities under investigation fragmented structures (Bernay, Val-de-Reuil). Economic situation was an incentive to rethink mobility as a means of social integration, both by creating the conditions for boosting local development and links with the employment areas, even distant (Rouen , Caen, Paris , ...).

The SpotLAB was defined as an innovative design workshop dedicated to create an ecosystem of local actors (inhabitants, firms, associations, elected persons, transport operators,…) and to find new ways to offer "*more mobility with less an/or other transport means" in deprived areas*" as said by local SpotLAB sponsor. For that sponsor, it was clear that mobility opens on challenges that classic transport couldn't face, so mandate was to imagine new strategy in a collaborative manner. Association of frugality and digital (i.e. frug@lity), could also be taken by participants as an opportunity to design new and "cheap" services based on close relations between mobile temporalities and smartphones. Post-SpotLAB, a web site was created to explain work done and to propose to non-participants to join innovative ecosystem.

SpotLAB Societ@l mobilities. Brittany, laboratory of disruptive services strategy (2014)

Compared to Normandy, Brittany is much richer with a living and innovative ecosystem in ICTs applied to mobility. More, all actors (local and transport) agreed seeing High Speed Line Paris-Rennes

(planned for 2017) and new regional train Regio 2N implementation (planned from 2014 to 2019) as an opportunity to invent new personal and territorial services. Corridor Rennes-Saint Malo was chosen by SpotLAB sponsor as sandbox for proof of concepts before swarming all-around Brittany. It was the first time that local actors from regional and city level, associations and firms (startups and middle size) accept to work in partnership with transport operator on new trains implementation and services. That second SpotLAB was led in Rennes (Britanny) focused on "societ@l mobilities" to design disruptive service strategy, based on innovative synchronization between daily life and territorial paces. Again, like for Frug@l mobilities, association of societal and digital (i.e. societ@l) means that digital transformation changes everything in daily life.

On a wider perspective, these two case-studies in transport sector have been chosen by paper' authors because they are significant of "transport to mobility" paradigmatic shift " public transport firms are living. Transport sector is at a crossroad between transport firms staying pure operators or becoming mobility ecosystem and product-services designers. That major mutation both societal and organizational highlights have consequences for daily trips and feed current temporal regime transformation.

So, to give sense to that ongoing paradigmatic shift, a brief overview of temporal regime throughout history could be useful to better understand "global times factory" and its three times layers consequences on actual situation.

CASE-STUDIES ANALYSIS

As seen in previous section, SpotLABS, or KCP workshops, were designed to manage innovative process starting from a temporal vision to bring transport (technical times) and mobility (personal and societal times) in the debate. That meant academic literature on "transport to mobility paradigm shift" field testing with local actors. SpotLABs results showed that participants have widely integrated paradigm shift main ideas and workshops helped them to put words on it. In other words, deep debate was engaged between participants about contemporary traces of temporal layers trilogy: railway timetable as times hard structuration, compromises to struggle against social times fragmentation and then de-synchronization or need for disruptive innovation to generate new mobile usages to be more autonomous.

During first two SpotLABs sessions, design group elaborate a common vision of transport (socio-technical system) and mobility (societal vision with focus on connected people) via collective debates after inputs of new knowledge by scholars and experts (1st sequence) and provocative proposals to avoid fixation effects on usual theory-in-use (2[d] sequence). In last two SpotLABs sessions, objective was more to visualize new ideas and proposals (concept-projet) and to develop some projects. Workshop organization was focused on managing more accurately group rhythms for social (constituting SpotLAB community) and cognitive purpose (expansive exploration strategy).

SpotLABs management matches with literature on innovative design (Le Masson & al., 2010; Hatchuel, 2013) and management as collective action (Hatchuel, 2012), developing organizational agility coherent with dynamic capabililities potential (Teece, 2014).

Mobility SpotLABs as generative of common and shared vision of societal mutations

As said, both SpotLAB occurred in a favorable context with "transport to mobility" paradigm shift at the core heart. That mutation opened on new and innovative ways to think about joint transformation of city and transport based on concerns about people daily life, societal dynamics and digital transformation. Underlying that shift was a conceptual switch from techno-centered view focused on transportation objects (train, bus, bike, station,…) to uses-centered vision based on mobility as generative activity related to special times-space bubbles (travel more than train). Here, generative

activity is defined as "*couplings between goods, users and usages in a shared design space*" (Brown, 2013), whose space requires shared time to develop useful services.

Instead of transport sectorial approach (i.e. multimodality as linking different transport means), new mobility paradigm privileged global and integrated vision of personal experiences (i.e. multimobility, or mobilities, in our words). Two potential innovative fields appeared considering mobility experiences as travel full dimension and a shared topic between many actors so collaborative time-space dialog could be powerful.

Adopting a research point of view, we could say that participants questioning illustrated navigation between three visions of modernity : optimizing existing/future social technical system (industrial modernity), organizing negotiation process to share times based on reflexive process about own activities (late modernity) and accelerating innovation rhythms to fit with societal mutations, particularly digital ones (liquid modernity).

Projects as innovative temporal regimes producers

After four sessions, SpotLAB production was "project bricks" to be combined to elaborate exploration strategy to implement them. To do so, choice was made with two main criteria: contribution to daily agenda and time-to-use. In following, we'll present only significant projects according to temporalities management that drive to local and innovative temporal regimes.

At first glance, both SpotLABs verified research results on different values assigned to times by individuals (Henckel & al, 2013) according to a mix between activity carried out (work, shopping, leisure, culture, family ...) and on times pressure (Rosa, 2010). But, SpotLABs showed that it's not the same according to location (house, public space, transport, ...) as each activity produces its own rhythm which could be different due to place situation, so new opportunities were seen as available to design new trip and services. Therefore, for participants, travel time could be no longer wasted, empty, but can be useful time to work, relax, learn, ... Times value topic opens up questions about relationship between mobility and immobility, to manage temporal pressure to chain activities, for example in urban-rural transitions in Normandy SpotLAB. This is important for people working away and for which travel time is as much a question of quality of life and job access. Strong problem in cities concerns small and local logistics as it's not easy to coordinate personal and delivery temporalities. Frug@l mobilities SpotLAB explored two ways about exploiting residents and temporary cross mobility flows. First one was "mobility by procuration" with retired persons who could pick up packets on behalf of other people who work away or, creating "local drive" with neighborhood shops nearby public transport parking. Another disruptive proposal was "railway Google car" (driverless and on-demand device) to replace empty trains during off-peak hours.

Finally, Societ@l mobilities SpotLAB resulted in concepts among which some were chosen by design community members to illustrate "mobility times high quality standard" as new reference for mobility quality. For example, "Lorient Express" could be designed as a tourism train concept to visit Britany in 3 days living on-board using with journey on little used railway infrastructure and night stops in renewed stations. Intent was to make analogy with "Orient Express" mythic train in terms of name (Lorient is city of Brittany) and for its capacity to create a specific temporal regime on-board (cruise). That means inventing luxury, but local, train with cabins to sleep, sitting rooms, places for events or exhibition by local artists, catering by local restaurants, …. All these services could be done by different local actors and not only by transport operator which plays more a role of trusted third party organizing services innovative platform with support of firms association and tourism local authority. More, Lorient Express could propose not only luxury travel but also daily trips connecting insulated small cities. In our view, Lorient Express was a temporal-object generative of local temporal regime based on potentially expansive set of temporalities (railway, services, tourism, cultural, territorial,…) whose rhythms converge according to shared common purpose.

FINDINGS

As mentioned above, literature traditionally analyses separately temporal regimes and design processes. More, temporal regimes are not considered as design's object and innovative design is not considered as a dimension of temporal regimes. Yet, we make a step in the direction of integrating literature from public transport and management science to better understand transportation evolution on the long run and to design strategic collective action. In that paper, even if we gave indications on transport/mobility transformations, the case-studies highlight more contemporary period to illustrate current societal mutation. Temporal personal organizations are changing, knowing that daily trips are quite best place to observe new practices and behaviors rising, producing new times regimes.

First result, city temporalities are not a pre-defined data to reconcile (cf. software period), but an object to be managed in a collaborative innovative design process with mobility topic at the core heart according to daily mobilities growing importance for citizens. A collaborative network has to be designed including temporal regimes of end-users (personal times), transport operators (technical and mobility services times), other firms and local actors (services times). SpotLABs showed that Transport operators could be best project manager to bring out innovative ecosystem, as operators are the only common partner between all actors (users, associations, firms, public authorities).

In short, SpotLAB version of KCP workshops could be generative of new temporal regimes based on openness and constructive dialoguing to (re)build temporalities in the course of collective action. So, "times" of everything (city, transport, users, firms,…) could be conceptive if appropriate innovation management device (i.e. KCP workshop), tailored to fit situation and actors, is implemented.

Widely, modern transportation and mobility temporalities have always been conceptive and produced different temporal regimes since railway creation around 1820. Over times, main difference was balance between transport and mobility with a growing importance of mobility that changed users and public transport firm action logic. Facing more and more temporal diversity and variety, public transport changed role from pure transport operator, to mobility operator and, finally, mobilities designer. From early 19th to 20th, transport development was conceptive technic-oriented with quantified railway time according to mobility temporalities requirements (logistics, leisure, work). From end of 20th, daily mobility was conceptive usages combination-oriented due to funding restriction on transport network development, except for High Speed Lines. Nowadays, on 21th, mobilities times diversity is conceptive services-oriented to cope with users empowerment demand and low-cost mobility. Both SpotLABs explored all these three dimensions in so far workshops were designed and managed to converge collectively towards a common vision of conceptive mobility temporalities.

This leads to the second point that was a second order result of innovative design workshops. As a consequence of conceptive mobility temporalities common vision elaborated with various actors, temporal hybrid irreducible nature - mobile and fixed, territorial and virtual, individual and collective, public and private- calls for a cross-discipline approach of public firm management, including inputs from social research. To be effective, that enlarged approach required to develop new capabilities for future collective action "*stimulating (…) ecosystem with sociotechnical imaginaries*" and « *organizational mechanisms of collaboration [that] exceed open innovation logics to focus on the collective building of favorable emergence conditions for new industrial ecosystems*" (Hooge & Le Du, 2014). SpotLABs played that capabilities catalyst role that could be developed after workshop process by participants developing collective cohesiveness projects. In that, innovative design ecosystem created by SpotLABs, in addition to being valuable for participants back to their organization, promoted local innovative design community. That community shares a common language, for example to speak about "knowledge base" used during four-step process, and common references, for example to describe what is innovative for the group. SpotLABs final debates on proposals highlighted "sociotechnical imaginaries" convergence between participants that led to collective action

proposals like "railway Google car" (Frug@l mobilities SpotLAB) and reciprocal invitations between sessions illustrated social network power.So, common language and common references based on similar imaginaries could be taken as SpotLABs innovative group identity emergence during workshop process and after (Frug@l mobilities web site).

Even ephemeral, that innovative identity was a solid basis to engage in project process as some proposals are quite early ideas to develop by network of new design community. That post-SpotLAB project process is described by scholars as "exploration strategy" (Hatchuel, 2009; Elmquist & Segrestin, 2009) to insist on need for "new knowledge" to implement disruptive ideas. Last SpotLAB session was dedicated to engage participants in light decision-making process (choosing most disruptive ideas) and future involvement (what will my role and that of my institution?) to prepare exploration strategylaunching by participants or by newly recruited actors. That point is coherent with innovative design theory which stresses the importance of KCP dual social and cognitive dimension (Hatchuel & al., 2013; Le Masson & al, 2010 & 2014).

Last result, new models of rhythmic dynamics emerged from the collaborative action, oscillating between alternatives to mainstream temporalities and disruptive approaches that induce creative (re-) organizations of urban time-space usages. For example, Lorient Express (SpotLAB Societ@l mobilities), was temporally innovative in many ways aggregating quite incompatible times regimes from tourism and daily trips, territorial connecting and product-service platform in a specific "time-object" temporalities diversity (individual/collective, public/private) and rhythms variety associated. Originality of that time-object type holds in collaborative design to integrate actor temporalities and generative design to create new products and services compared to usual transport based on unified times regime. In terms of innovative design theory (Le Masson & al, 2010), understanding time-object capabilities (i.e. Lorient Express) looks like understanding object identity mutation (new technologies, new functions, new usages, new business models) from transport object (tourism train on little used lines) to mobility time-object (societ@l open platform generative of new usages and so, attractive for users, territories and economic actors). In other words, that time-objet unleashed actors innovative capabilities to generate new mobile usages for example on-board catering service by local restaurant or startups corner. Remaining questions stay on which economic principles to apply to qualify business opportunities associated with services generative platforms . and individual and collective capability to design personal services respectful of daily temporalities and rhythms. This openness of the initiative underlines innovation efficiency of time-object capabilities which is also generative for new partnership in the ecosystem.

The findings confirm previous research on innovative nature of "times structuration" since creation of railway in 19th and the paper presents some points to feed that debate with an accent on temporal regimes framing by mobility and SpotLAB device, KCP workshop inspired, as a way to strengthen collective action for innovative design.

CONCLUSION

The first conclusion is that this field research is exploratory but confirms that "times" are an innovative topic at all and, especially, for transport companies since ever. But, innovation regimes have changed from railway unique prescriber to shared design with endless network of various actors considered as peers (Segrestin, 2006; Chesbrough, 2011). But, to be effective, innovation needs powerful device like KCP Workshop (i.e. SpotLAB) to initiate innovative design process to avoid fixation effects on individual actor expectations by structuring innovative design process (Le Masson & al., 2010, 2014; Hatchuel & al., 2013).

Second point that can be drawn from this work is that temporal regimes generativity over times has been linked to strategic changes for transport firms: from prescriber position (railway and transport hardware era) to societal responsibility (times fragmentation and transport software era) and, nowadays, temporal innovation (digitalized mobilities and everyware era). Contrary of some experts and scholars, we argue that transportation has always been innovative but in very different ways we have to highlight. Times and temporal regimes area good topic to show that we need divergent conceptual work to see innovation. To be more specific, while technical, innovation was easy to characterized (Schivelbusch, 1990), but since eighties, innovation is more versatile based on software tools which are less visible than train-object and more related to societal breakthrough like explosion of personal ICTs and social networks.

Last point, SpotLAB approach results could be reverse inputs for social sciences considering mobility collective design instead of a social fact to deconstruct (Hatchuel, in David & al., 2012). Even if proponents of mobility-turn (Urry, 2000; Cresswell, 2006) have adopted a more constructivist view with mobile methods development (Büscher & Urry, 2009), they could benefit enlarging research cope by integrating results on innovation applied to times structuration and temporal regimes strategic management.

Nevertheless, several limitations to this study exist. Only two SpotLAB have been realized on times issues, so results could be relative to local situation. SpotLAB organization have been done integrating numerous inputs from prospective and research on times, temporal regimes, temporalities and rhythms (Heurgon & Laousse, 2004; Laousse, 2009 & 2010) but we need to clarify relevance of that knowledge base. Thus, more research is needed too to consider consequences of temporal regimes as a dimension of mobility-turn for management science in so far late modernity (and liquid) produces an anthropological mutation based on new relations to times and spaces.

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