

R. Ryan Nelson
 University of Virginia
 (U.S.)

Karen J. Jansen
 University of Virginia
 (U.S.)

Executive Summary

Every IT project experiences a distinct energy pattern—or momentum—during its lifecycle. An important role of the project manager is to recognize that pattern and make the adjustments necessary to ensure project success. This article defines the concept of momentum within the context of IT projects, introduces a tool for mapping and analyzing momentum, presents a representative case example, and identifies the lessons gleaned from analyzing the momentum maps of 51 IT projects. It also identifies a set of levers that project managers can use to proactively manage momentum and provides three specific guidelines for using momentum maps as a proactive management tool, as a retrospective tool (for post-implementation audits), and as a tool for communicating with project stakeholders.

THE VALUE OF MAPPING PROJECT MOMENTUM

“When you’ve got the momentum in a football game ... that is a time to keep going and get it into the end zone ...” (Vince Lombardi)

“About five months into the project, momentum dropped significantly when the team realized that the go-live date would be missed and another project manager joined the project.” (Project team member)

Momentum is often used to describe the shifting energy associated with a football game or a political campaign. Organizations and projects experience similar fluctuations in momentum, especially when actively pursuing a goal or vision. Pictorially mapping momentum at various points in time during an IT project can be a valuable tool for project managers because it enables them to observe momentum trends, compare momentum patterns across various stakeholder groups, and plan the next steps for building or sustaining momentum. Momentum maps can also be used retrospectively (i.e., in post-implementation audits) to learn how the pattern of momentum fluctuations led to a successful and timely project completion or the point at which a failed project was derailed.²

In this article, we define the concept of momentum, present several IT-related examples of momentum mapping, discuss observations from maps obtained from 51 IT projects, and provide guidelines to help project managers map and manage project momentum.

THE MOMENTUM CONCEPT

Momentum has been defined as the level of energy (i.e., a force of movement) associated with a collective’s pursuit of a goal-directed initiative. It has been examined at multiple levels, including collectives pursuing social change, groups participating in sporting contests, and organizations implementing large-scale

*MISQE is
 Sponsored by*



¹ Blake Ives is the accepting Senior Editor for this article.

² Kerth, N. L. *Project Retrospectives: A Handbook for Team Reviews*, Dorset House Publishing, 2001; Derby, E. and Schwaber, K. *Agile Retrospectives: Making Good Teams Great*, Pragmatic Bookshelf, 2006.

change.³ From start to finish, all IT projects experience fluctuations in momentum, benefiting from events that create positive momentum (e.g., endorsements, project kick-off meetings, high visibility, or reaching milestones) and suffering from events that decrease momentum (e.g., competing projects, technical glitches, or staff turnover). It is important to note that momentum is often socially constructed among participants as they attempt to make sense of events and their implications. Research has established that social information conveying urgency (e.g., “we need to do this”), feasibility (e.g., “we can do this”), progress (e.g., “we are doing this”), and dramatic devices (e.g., music, moving appeals, powerful imagery) are positively related to momentum.⁴

GRAPHING PROJECT MOMENTUM

Using graphical data to identify organizational phenomena is not new.⁵ For example, Sabherwal et al. (2001) created graphical depictions of how the rate of change in specific alignment-associated events varied over time, to demonstrate the concept of punctuated equilibrium. Focusing on new technology development, Tyre and Orlikowski (1994) created a graphical depiction of how the rate of change (described as the level of adaptive activity) since installation of the technology varied over time. Their resulting graph illustrated a key insight—that projects have a relatively brief window of opportunity to explore and modify new process technology. At the project level, Keil (1995) produced a map of project information (positive, ambiguous, or negative) at key decision points during a decade-long project to

capture how one factor (organizational commitment) was concealing negative information that should have led to suspending the project. In summary, graphical depictions such as these can provide valuable insights that alternative approaches miss. According to Tufte, “of all methods for analyzing and communicating statistical information, well-designed data graphics are usually the simplest and, at the same time, the most powerful.”⁶

Visual depictions of trends in IT project momentum over time and reasons for fluctuations provide project managers with opportunities to capitalize on rich process data. For example, momentum maps can be used as a communication tool to collectively make sense of events, learn from various stakeholders’ perspectives, and identify important triggers of momentum shifts.

ANALYZING IT PROJECT MOMENTUM

For this study, we conducted a qualitative analysis of 51 momentum maps that were captured by graduate student teams while conducting post-implementation audits (called “project retrospectives” in the rest of this article) between 2005 and 2008.⁷ These maps effectively illustrate how each project has a unique pattern of momentum fluctuations. In fact, project team members often commented on how valuable the momentum maps were for highlighting underlying dynamics and “breathing life” into how and why events unfolded as they did.

We also evaluated the success of the projects from both process (i.e., time, cost, and product) and outcome (value, use, and learning) perspectives.⁸ Based on the success rates shown on the next page, we conclude that proactive management of a project’s momentum *during implementation* (rather than in retrospect) could not only lead to time-related improvements, but also to improvements in the other five areas.

3 See, for example Adler, P. *Momentum: A Theory of Social Action*, Sage, 1981; Jansen, K. J. “From persistence to pursuit: A longitudinal examination of momentum during the early stages of strategic change,” *Organization Science* (15:3), 2004, pp. 276-294; and Burke, K. L., Burke, M. M., and Joyner, A. B. “Perceptions of momentum in college and high school basketball: An exploratory case study investigation,” *Journal of Sport Behavior* (22), 1999, pp. 303-309.

4 Dutton, J. E. and Duncan, R. B. “The creation of momentum for change through the process of strategic issue diagnosis,” *Strategic Management Journal* (8:3), 1987, pp. 279-295; Gersick, C. J. G. “Pacing strategic change: The case of a new venture,” *Academy of Management Journal* (37:1), 1994, pp. 9-45; Ginsberg, A. and Venkatraman, N. “Institutional initiatives for technological change: From issue interpretation to strategic choice,” *Organization Studies* (16:3), 1995, pp. 425-448; Jansen, op. cit., 2004.

5 Sabherwal, R., Hirschheim, R., and Goles, T. “The dynamics of alignment: Insights from a punctuated equilibrium model,” *Organization Science* (12:2), 2001, pp. 179-197; Tyre, M. J. and Orlikowski, W. J. “Windows of opportunity: Temporal patterns of technological adaptation in organizations,” *Organization Science* (5), 1994, pp. 98-118; Keil, M. “Pulling the plug: Software project management and the problem of project escalation,” *MIS Quarterly* (19:4), 1995, pp. 421-447.

6 Tufte, E. R. *The Visual Display of Quantitative Information*, Cheshire, CT: Graphics Press, 1983, p. 9.

7 The tool used in the research for creating and analyzing momentum maps can be downloaded in either Word or PDF format via the following links: <http://gates.comm.virginia.edu/trn2n/momentum.pdf> and <http://gates.comm.virginia.edu/trn2n/momentum.doc>.

8 For an in-depth discussion on evaluating project success, see Nelson, R. R. “Project Retrospectives: Evaluating Project Success, Failure, and Everything in Between,” *MIS Quarterly Executive* (4:3), 2005, pp. 361-372.

% of Successful Projects	
Time	33%
Cost	41%
Product	55%
Value	65%
Use	76%
Learning	80%

THE COLLEGE BOARD'S IODS PROJECT: A CASE STUDY OF MOMENTUM

To demonstrate the important role momentum fluctuations play in IT projects, we describe a project implemented by the College Board using the summary momentum map (consolidated from developers', managers', users', and sponsors' retrospections) depicted in Figure 1.⁹

In 2007, the College Board¹⁰ initiated the integrated Operational Data Store (iODS) infrastructure project, with the objective of laying the foundation for provisioning high-quality, integrated, and timely

information throughout the organization. The first iteration of iODS had a team of 31 people, a budget of \$2.5 million, and a deadline of June 2008.

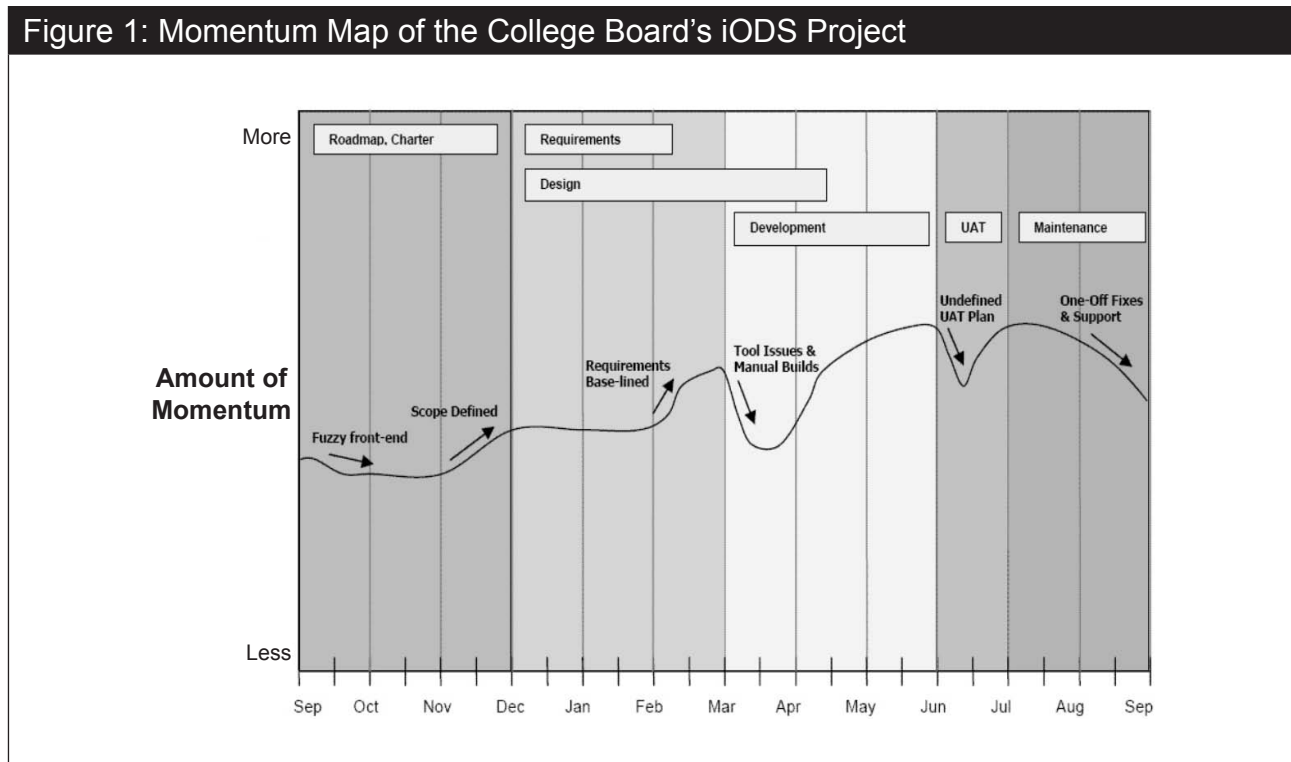
As depicted in Figure 1, the iODS project experienced an early decrease in momentum, attributed to team formation issues and spending too much time in the “fuzzy front-end” waiting for approval. As described by one of the project team members:

“In the beginning, the momentum was slow because the team was new, and we needed to define the scope and get approval from senior management on the charter.”

Another team member added:

“Roles and responsibilities of the team members were unclear, leaving enough room for confusion to cause a slowdown in project activities.”

Throughout the next several months of the project (requirements and design phases), momentum increased as major milestones, such as the definition of the project’s scope and the base-lining of the project’s requirements, were reached. Both of these



⁹ Momentum throughout the project lifecycle is assessed relative to an arbitrary starting point (approximately mid-way) on the vertical axis.
¹⁰ The College Board is a U.S. not-for-profit educational testing and educational reform organization that provides a variety of products and services to students, schools, and educational professionals.

milestones resulted in improved focus by everyone involved with the project. In the words of the project manager:

“Once the current-state documentation was complete, we all began to feel more comfortable with the size, depth, and complexity of the scope. This led to a surge in output as we ramped up on requirements and architecture leading into the Christmas break.”

At the beginning of the development phase (about halfway through the project), there was a significant decrease in momentum when the development team experienced several issues with the data warehousing tool and got bogged down by an initial build process that was manual and time-consuming. These issues delayed progress for several weeks. Once the team resolved the tool issues and locked down the build process, project momentum steadily increased until the end of development (end of May 2008).

Project momentum decreased for a third time during the user acceptance testing phase in June 2008. The team had not created a test plan and momentum stalled until one was created. As described by the information solutions manager, the lack of planning was exacerbated by bureaucratic processes, derailing what had been three months of increasing momentum:

“We were unsuccessful in adding resources midstream in user acceptance testing due to the lengthy authorization process. We did rebound from this episode but lost momentum. The aspect in my mind that doesn’t show in the curve is the unrealized gain we could have had from coordinating system and user acceptance testing had we planned earlier.”

Once user acceptance testing was completed and the project went live, there followed a period of maintenance, consisting of low-priority bug fixes and user-requested enhancements. Only a subset of the team was involved during this period, and the project was winding down, so momentum naturally declined during this period.

In their concluding remarks, the retrospective team classified this project as a success, citing that it came in just under budget, met the target date, and delivered a high-quality product. The team attributed much of this success to two factors:

1. A tight project schedule, which pushed everyone to work faster than they might have done if there had been a more relaxed project schedule.

2. Effective communication practices (e.g., daily development team review meetings and weekly team status meetings) that facilitated issue discovery and resolution, while generating positive momentum at key points throughout the project.

MANAGING IT PROJECT MOMENTUM

The iODS project is representative of the 51 projects studied in that each project experienced numerous fluctuations in momentum. Some of the fluctuations were effectively managed by project leaders and some were not. We highlight below the insights into managing IT project momentum gleaned from our synthesis and qualitative analysis of the 51 momentum maps.

Stakeholders Mostly Have Convergent Perceptions of Momentum ...

In general, the various stakeholders of a given project were found to share similar perspectives on momentum—particularly when considering the general shape of the map over time, the slope of the curve, and significant changes in direction.¹¹ In other words, when viewed holistically, different stakeholders tend to have a similar view of the impact that significant events¹² have on project momentum. This finding was especially profound at various points in the project lifecycle—e.g., at project kickoff, during the later stages of a project, and when there are particularly steep slopes representing dramatic changes in project momentum. Consistent with previous research, our analysis found evidence that different stakeholders’ perceptions of momentum converged as momentum built.

... But Some Stakeholders Can Have Different Perspectives

While most of the 51 retrospective teams presented a consolidated momentum map of a project (as depicted in Figure 1), some teams retained individual

¹¹ Actual levels of momentum and the variance at any specific point are less relevant than the slopes, changes in direction, and general shape of the curve over time. In other words, we are more interested in the first derivative of the relationship than in the actual values at any one point in time.

¹² Jansen, op. cit., 2004, proposed that events differ in terms of their impact. She pointed out that events may be localized (e.g., influencing a certain subset of those involved), codifying (e.g., large-scale agreement across all involved parties), or equivocal (e.g., a variety of interpretations as to whether the event contributes to or detracts from momentum).

stakeholder maps to depict different stakeholder perspectives. As described above, stakeholders shared a fairly consistent view of momentum fluctuations throughout the life of a project, especially at major events or significant shifts in momentum. However, there was a small subset of maps that depicted dramatically different perceptions of project momentum. For example, the map in Figure 2 reveals a client and vendor having diametrically opposing views of the momentum of a project to launch a new software product. While the vendor’s perception of momentum increased as a major deadline approached (pre-launch on the map), disagreements in the client organization over key features coupled with schedule concerns contributed to the perception that momentum decreased significantly at this seminal point in the project life cycle. Following the deadline, the vendor’s momentum started to fall—the push was over and the lack of change management had taken its toll. Conversely, the client team began to build momentum to bring the project to completion.

In analyzing the subset of maps depicting multiple stakeholder perspectives of project momentum, we observed that managers’ maps tended to be both higher and flatter (fewer dramatic peaks and valleys) than those of project team members and end users. We believe this indicates an optimism on the part

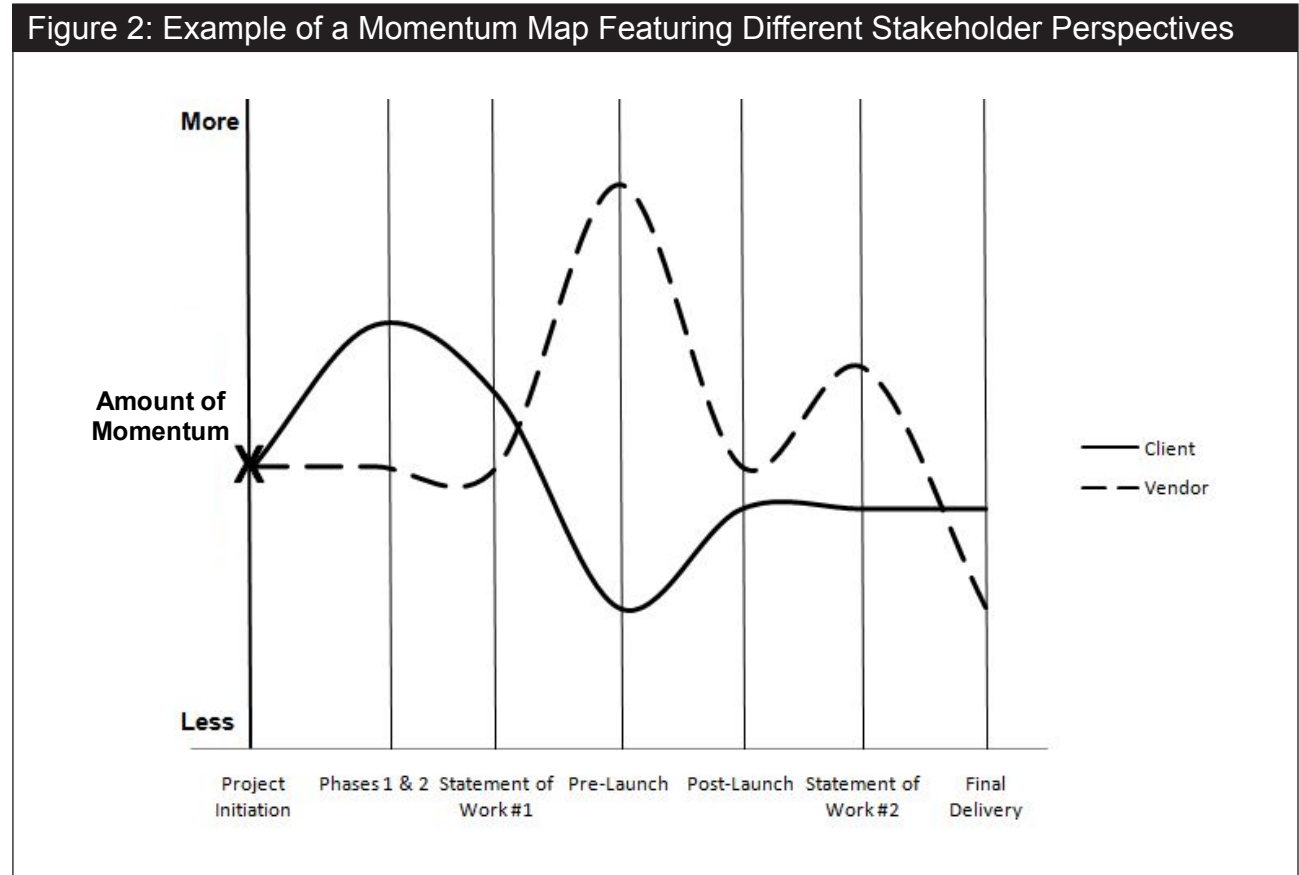
of managers that is not always shared by all team members and end users. So, even with general agreement on the shape of a map, various stakeholder groups often have interesting patterns of divergence, suggesting that some events may affect certain stakeholders in different ways.

Project Start and Finish

The vast majority of the 51 projects studied (84%) began with an upward trajectory in momentum, indicating that projects tend to start off with significant positive energy. Key events that trigger this positive start are kickoff meetings and announcements, public endorsements by executive sponsors, and social interactions. On the other hand, momentum at the end of a project was almost as likely to be on a downward trajectory (45%) as an upward one (55%). Key events that were correlated with declining momentum at the end of a project included missed deadlines and budgets, disenchanted users, and “burned out” team members.

Positive and Negative Spirals

We also examined the maps for graphical signs of overall increasing or decreasing momentum. About a third (35%) of the projects exhibited a positive (or



upward) spiral, defined as having positive trajectories that increasingly outweighed negative dips as the project moved through its lifecycle. A project whose overall momentum remains above the baseline with a positive spiral is perhaps the best case scenario for a project's momentum. In contrast, 12% of projects showed signs of a negative spiral, with negative dips increasingly outweighing positive trajectories over time. Negative spirals represent an overall decrease in energy over time and possibly also indicate that stakeholder commitment declines as the project progresses. The maps of the remaining 53% of projects exhibited no clear overall trend up or down.

Inflection Points

The most interesting features of the momentum maps are the inflection points—where there is a significant change in the direction of project momentum. On average, projects experienced a total of five significant changes in momentum during their lifetime (between start and finish). With an average project length of just under two years (range = 6 to 72 months), *this means there was, on average, about 4.75 months between inflection points.* We examine the activities contributing to changes in the direction of momentum in more detail below.

Factors Contributing to Momentum Increases and Decreases

Project managers who are aware of the events and activities that positively and negatively influence momentum, and the effect these events may have on various constituents, can better manage momentum and thus potentially shorten implementation time and improve the chances of project success. Figure 3 lists the top five factors contributing to momentum increases and decreases that were uncovered through our retrospectives. These factors indicate the key levers available to project managers for maintaining and increasing momentum during the course of an IT

project. Note that some factors, such as a change in project leadership, could, in different circumstances, contribute to either an increase or decrease in momentum.

It was not surprising to learn that 55% of the projects experienced significant increases in momentum when stakeholders perceived progress toward their goal. The completion of key deliverables is clearly the best driver of positive momentum in an IT project. While the next two factors contributing to increasing momentum are relatively straightforward to implement (e.g., by formulating and executing a good communication plan), the fourth—changing the project manager—can involve a great deal of effort and disruption. Even so, 20% of the projects in our research experienced a significant turnaround in momentum after replacing the project manager, and this, in turn, contributed to the eventual success of the project.

Slow progress or missed deadlines resulted in declining momentum in 53% of the projects. Resource constraints (e.g., inadequate staffing) and technical problems (e.g., the crash of a server) were also fairly common causes of declining momentum, each experienced by roughly 30% of the projects studied.

Our finding that the average project experiences five significant changes in momentum (inflection points) during its life cycle, provides a useful heuristic to project managers seeking to increase momentum, while avoiding the seemingly inevitable “land mines” (those factors that decrease momentum) along the way. None of the 51 projects went from start to finish without experiencing at least one significant decrease in momentum at some point. If several months have passed since the last downward turn in momentum, our data suggests that project managers should be on the lookout for land mines and take appropriate action. Most of the negative factors shown in Figure 3 are, at least to some extent, under the project manager's control.

Figure 3: Top Five Factors Contributing to Momentum Increases and Decreases

Increases	% of Projects	Decreases	% of Projects
1. Perceived progress toward goal (e.g., completed deliverables).	55%	1. Slow progress or missed deadlines.	53%
2. Launch events tied to project.	24%	2. Resource constraints.	33%
3. Communication (e.g., key announcements).	22%	3. Technical problems.	29%
4. Change in project leadership.	20%	4. Requirements issues.	25%
5. Sponsor encouragement.	18%	5. Ineffective/changing project leadership.	20%

As mentioned above, the best case scenario for a project manager is to have a project experience a positive spiral—i.e., positive trajectories increasingly outweighing negative dips as the project moves through its lifecycle. In such a scenario, sponsor engagement feeds social interactions, which in turn feed progress—a self-reinforcing positive spiral. On the other hand, project managers need to do everything in their power to avoid negative spirals and the loss of commitment that tends to follow. Our anecdotal evidence suggests that these projects have a greater likelihood of failure in all six areas noted above.

GUIDELINES FOR PROJECT MANAGERS

Based on our research findings, we offer project managers three guidelines.

1. Use Momentum Maps as a Proactive Management Tool

Project managers should create prospective momentum plans to accompany their project plans. A project momentum plan will help to identify where inflection points (such as the periods leading up to and following major deliverables, holidays, etc.) are likely to occur. Armed with this information, the project manager can plan to use the appropriate levers that will stabilize or counteract significant swings in momentum. Once a project is underway, maps drawn from input provided by key stakeholders can shed light on how project events are affecting momentum. Trends in momentum provide valuable input when considering which levers to deploy, the most critical stakeholder groups, and the best time to intervene. The College Board iODS case study is a good example of a project that benefited not only from weekly status meetings, but also from daily reviews that served to alert the savvy project manager and allowed him to take timely corrective action. Project managers will also obtain valuable mid-project feedback on whether their efforts were successful.

2. Use Momentum Maps as a Retrospective Tool

Retrospectives are, by definition, stories of past projects. Maps such as the ones presented in Figures 1 and 2 provide a rich source of qualitative information on momentum fluctuations associated with key events that occurred during the project lifecycle. As such, they go a long way to extending the basic

information provided by a timeline and help to paint a more accurate picture of what actually happened, when it happened, and how significant the impact was. In *Agile Retrospectives: Making Good Teams Great*,¹³ Derby et al. propose that energy surveys called “emotional seismographs” be captured after every major iteration or release. By taking the time to learn from the past, project managers will be better positioned for success in the future.

3. Use Momentum Maps as a Communication Tool

Momentum maps can also be used to convey *changes in project perceptions* to organizational leaders and project participants. Especially with complex temporal phenomena, it is frequently difficult to convey results in a simple manner. However, seeing a consolidated momentum map or the divergence across stakeholder groups or functional departments in a visual graph can reveal much about the health of a project, in much the same way that social network diagrams have become a powerful management tool. When the maps of different stakeholder groups vary greatly, as they did in the vendor-client example above, diverse perceptions of project outcome can be expected as well. We therefore encourage project managers to use momentum maps not only as a diagnostic tool, but also as a means for communicating perceptions of project momentum to key stakeholder groups (e.g., team members, sponsors, and top management).

CONCLUSION

The objectives of this article were to define the concept of momentum within the context of IT projects, introduce a tool for mapping and analyzing momentum fluctuations, and report on the key insights obtained from analyzing momentum maps across 51 IT projects. We have identified the key events or activities contributing to momentum fluctuations, shown that these can be employed to proactively manage momentum, and provided three guidelines for project managers. In short, our aim has been to generate some energy around the intriguing and important phenomenon of project momentum.

ABOUT THE AUTHORS

R. Ryan Nelson

R. Ryan Nelson (rnelson@virginia.edu) is Professor and Director of the Center for the Management of

¹³ Derby, E. and Schwaber, K., op cit., 2006.

Information Technology (CMIT) at the McIntire School of Commerce of the University of Virginia (UVa). He received his Ph.D. in business administration from the University of Georgia in 1985 and spent five years on the faculty of the University of Houston before joining UVa in 1990. His research has been published in such journals as *MIS Quarterly*, *MIS Quarterly Executive*, *Journal of Management Information Systems*, *Communications of the ACM*, *Information & Management*, *International Information Systems*, *Data Base*, and *CIO*. He currently serves on the editorial board of *MIS Quarterly Executive*.

Karen J. Jansen

Karen Jansen (kjansen@virginia.edu) is an Assistant Professor at the McIntire School of Commerce at the University of Virginia. She received her Ph.D. in management from Texas A&M University. Her research broadly explores the process and impact of change on an organization's employees, with special interest in how change processes gain, sustain, and lose momentum over time. Jansen's research has appeared in *Organization Science*, *Organizational Behavior and Human Decision Processes*, and *Journal of Applied Psychology*. She is on the editorial board of the *Journal of Applied Behavioral Science*. Before becoming an academic, Jansen worked for IBM as a systems engineer.