

TAKT TIME PLANNING IN CONSTRUCTION AND ITS IMPACT ON THE WORK-LIFE BALANCE FOR INDIVIDUALS AND FAMILIES

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ABSTRACT

This paper explores the time management challenges in construction management, emphasizing the prevalence of crisis-oriented work, stress, and burnout. Integrating Takt Time Planning (TTP), a method that establishes production cadence, proves to be transformative in effective construction scheduling. TTP yields benefits like the establishment of flow, enhanced problem detection, and waste reduction. Despite a growing body of research on TTP, there is a notable gap regarding its impact on the ability of individuals to achieve and maintain a healthy work-life balance in the construction industry. The focus of this paper is to explore current research and literature to investigate the connection between TTP and its impact on work-life balance and emotional health. Through a literature review and synthesis of information, the authors identified a likely connection between TTP implementation and an improved well-being for construction professionals and their families.

KEYWORDS

lean, takt, construction, scheduling, work-life balance, family life

INTRODUCTION

TIME MANAGEMENT IN CONSTRUCTION MANAGEMENT

Time management is a crucial aspect in the lives of construction managers because it enables the manager to prioritize their tasks, improve their productivity, and by so doing, reduce their stress and maintain a healthy work-life balance (Jex, et al., 1999). In the popular book, *The 7 Habits of Highly Effective People*, Covey presents the notion that all tasks can be categorized by two factors: urgency and importance. To help his readers visualize this concept, Covey used an Eisenhower Matrix (Refer to Figure 1) to show how and where people spend their time.

According to Covey, those who are most effective at time management spend much of their time in quadrant two and spend as little time as possible in the other quadrants (Covey, 1990). Construction managers, however, tend to find themselves spending the majority of their time in quadrant one. This is especially true once their project falls behind schedule. In the book, *Construction Scheduling: Principles and Practices*, Newitt writes that oftentimes project managers “...go from crisis to crisis, with the project managing them rather than them

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managing the project...Most managers tend to live and die in quadrant one” (Newitt, 2009, p. 7).

Newitt elaborated on this concept further when he went on to write, “One of the major concerns with construction managers is the total control that projects seem to take over the manager’s life. It is not uncommon for project managers to find themselves consumed by a project. Many work 60 to 80 hours per week, with 65 to 70 hours the standard. These long hours, in addition to the associated pressures of meeting the project objectives, tend to take their toll on managers. This type of lifestyle, if it continues over several years, threatens not only the personal health of the manager but also the manager’s relationship with his or her family. “Burnout” is a problem in the management circles of many construction companies. As stated earlier, the key is to learn to control your projects so they do not control you.” (Newitt, 2009, p. 8)

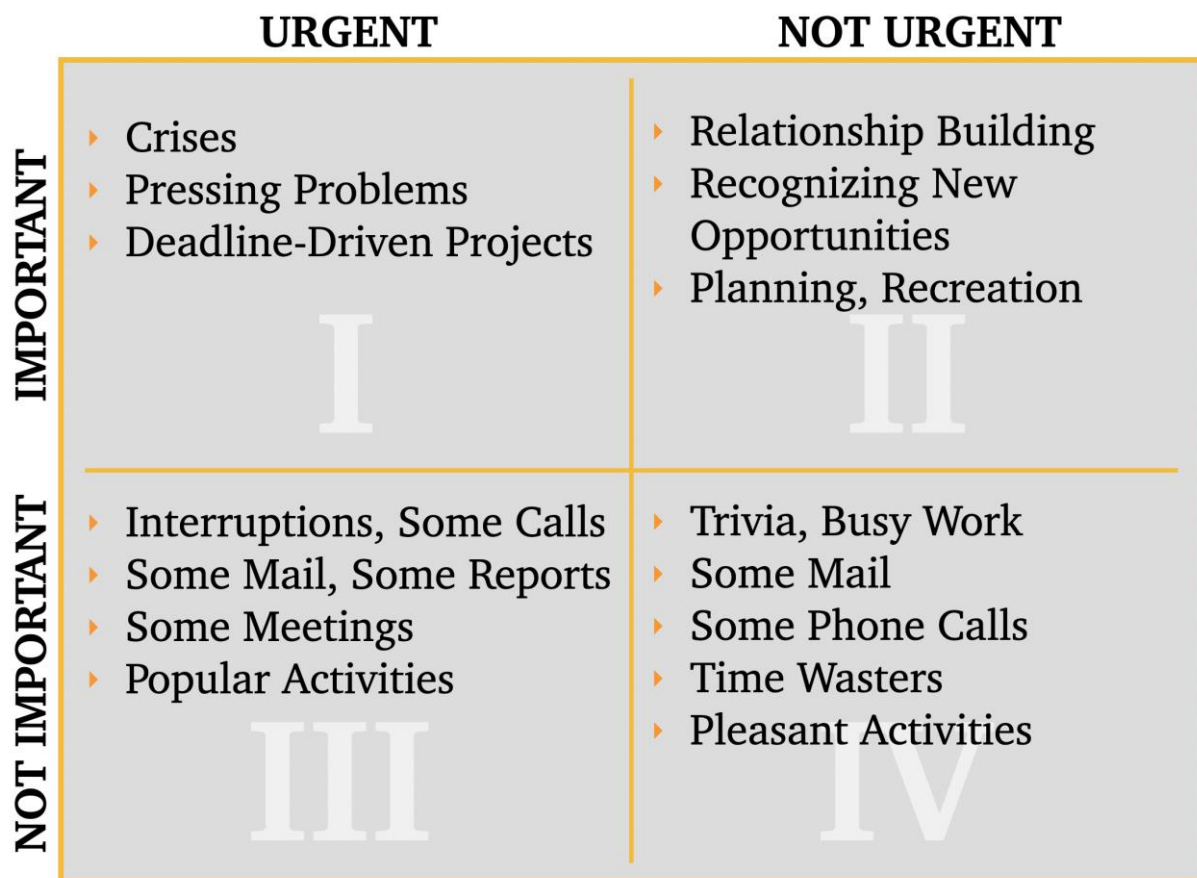


Figure 1: The Time Management Matrix (Covey, 1990)

The main means by which construction managers control the various aspects of their projects is through effective scheduling. Scheduling is the primary tool for organizing, coordinating, and communicating the planned methods and procedures that will ensure project objectives are met and accomplished. While good scheduling establishes a structured and controlled process for which the necessary tasks are to be accomplished, effective scheduling seeks to establish a process that enables the project to be completed in the most productive manner possible. Effective scheduling thus empowers managers to spend the majority of their time in quadrant two and less time addressing the crises and pressing problems that usually arise from ineffective scheduling.

TAKT TIME PLANNING

Takt time planning in construction is a work structuring method that aligns the production rates of trades by pacing work through a set of spatial areas in a set sequence. By so doing, project teams can create a continuous workflow, reliable handoffs, and an opportunity to continuously improve the production system (Frandsen, 2019). When incorporated into construction scheduling and used in conjunction with principles from systems such as the Last Planner® System (LPS) and Scrum, Takt is a tool that project managers can use to shift their time and energy towards the more productive tasks of quadrant two. Takt Time Planning is a powerful instrument in the hands of the construction manager because it enables project teams to take control of their projects through the establishment of rhythm, consistency, and continuity (Binninger et al., 2019).

The word Takt comes from the German word ‘Taktzeit’ which means beat, rhythm, or cadence (Haghsheno et al., 2016). Takt refers to the cadence or regularity in which activities are to be completed. Since the early 1900s, Takt has been an important practice in the manufacturing industry (Tommelein et al., 2022). Takt is not a new method in the field of construction. In fact, the first recorded use of Takt, in the United States, was in 1930 when work commenced on the Empire State Building (Haghsheno et al., 2016). While reflecting on the speed and efficiency of the construction of this famous New York City structure, Flyvbjerg wrote that in “an era when people marvelled at the efficiency of factories churning out cars...the Empire State designers were inspired to imagine their process [for building the Empire State building] as a vertical assembly line – except that the assembly line did the moving ...while the finished product stayed in place” (Flyvbjerg et al., 2023, p. xvi). Although the implementation of Takt into project schedules has been increasing in popularity (in the US) since the completion of the Empire State Building, Critical Path Method (CPM) continues to be the dominant method that is utilized in construction scheduling and planning. A survey conducted in 2003 found that 98.5% of the top 400 ranked contractors, in the construction industry, utilized CPM in their scheduling and planning needs (Kelleher, 2004).

Despite the benefits and widespread adoption of CPM, many construction companies still struggle to complete their projects on schedule. One publication reported that large projects typically take 20 percent longer to finish than originally scheduled (Agarwal et al., 2016). While another study, conducted by Dodge Data & Analytics, found that a staggering 61% of typical projects finish behind schedule (Lean Construction Institute, 2024). While CPM is useful in visualizing a project’s workflow it does not enable project teams to clearly see and manage the project’s trade flow (Kujansuu et al., 2020) and logistical flow (Tommelein et al., 2022). As shown in Figure 2, TTP allows for the visualization of and control over all three types of flow.

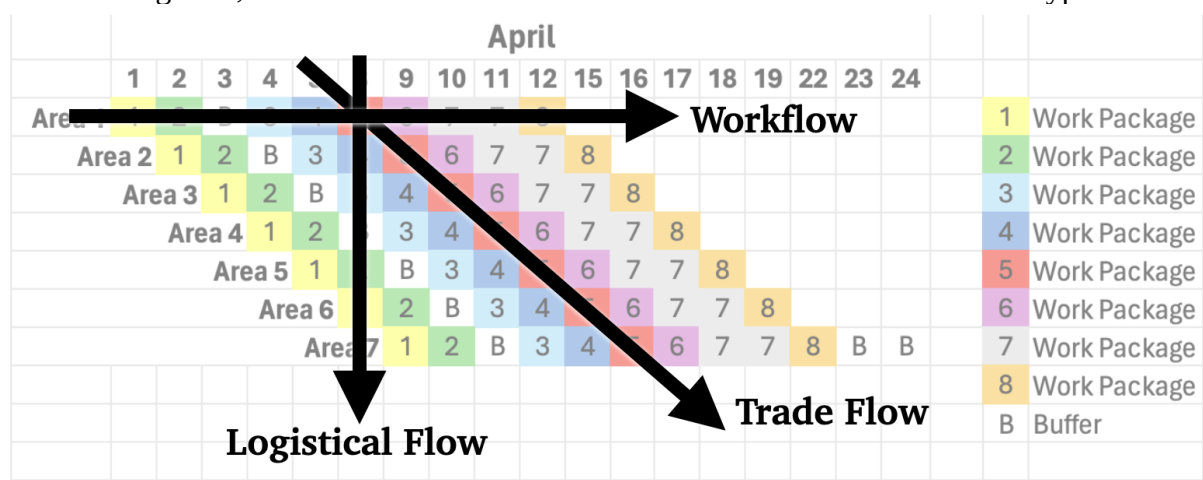


Figure 2: Types of flow that are visible and manageable when using TTP in a schedule

This paper is a literature review that is focused on exploring current research and literature surrounding the benefits of Takt Time Planning. This is done in an effort to investigate and better understand a possible connection between TTP and improved emotional health/work-life balance for construction managers. While TTP likely produces similar results for the tradesmen or labourer in the field, this paper only focuses on the relationship between TTP and project management (project managers, superintendents, foremen, and project/field engineers).

LITERATURE REVIEW

METHODOLOGY AND OVERVIEW

To investigate and better understand a possible connection between TTP and its impact on the work-life balance and emotional health of project managers, the authors explored current research and literature discussing the benefits of TTP. Over one-hundred and ten papers were reviewed that discuss TTP in construction. It's worth noting that of those papers, ninety-seven were published in an IGLC conference. An additional thirty papers, examining the topic of work-life balance, were also reviewed.

When reviewing the papers discussing TTP, abstracts were read and any mentions of a benefit surrounding the use of TTP in construction were recorded by tallying a table. Those papers were then read to ensure that the paper examined one or more benefits of TTP. The authors found that twenty-eight papers specifically addressed benefits of TTP (Refer to Figure 3). A breakdown of those papers, into broad categories, is as follows: 35% improvement to flow and duration, 18% improved communication, 18% enhanced problem detection, 14% improved accountability, 11% increased waste reduction, and 4% improved jobsite cleanliness.

PRESENT RESEARCH ON THE BENEFITS OF TAKT TIME PLANNING (TTP)

■ Flow/Duration ■ Accountability ■ Waste ■ Problem Detection ■ Cleanliness ■ Communication

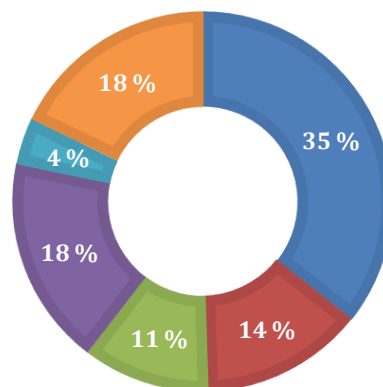


Figure 3: Research papers addressing the various benefits of Takt Time Planning

Researchers seem to have spent substantial efforts and resources exploring the benefits of TTP. For example, as TTP takes advantage of several production laws and principles, including Little's law, the law of Bottlenecks, the law of Variation, and Kingman's formula (Modig et al., 2011), it has been possible for researchers to demonstrate the mathematical underpinning and theory behind the application of TTP (i.e., Wardell, 2003).

BENEFITS OF TTP

During the review of existing literature, on Takt Time Planning, eight key advantages or benefits were identified by the authors. The existing body of research does not, however, make any connections between the use of TTP and an improved work-life balance for project managers. The eight identified benefits of TTP are:

1. Establishes Trade and Logistical Flow

By activities being worked on at the same rate and work areas released at standardized times and at a sustainable pace, trade flow is established (Kujansuu et al., 2020). Aspects such as pull planning, buffering, levelling, and packaging help to establish realistic and sustainable project durations. When aspects of the Last Planner® System (LPS), such as weekly work planning and pull planning, are used in conjunction with TTP, workflow reliability is established and the handoffs between the trade partners are defined (Ballard et al., 2021). As TTP makes the logistical flow of the project more visible to project management, logistical challenges can be planned for and addressed (Tommelein et al., 2022).

2. Enables One-Process Flow

If work areas are released to only one trade at a time, a ‘finish as you go’ approach becomes the standard. This minimizes ‘work in progress’ (Faloughi, et al., 2015) and can result in higher expectations for quality/craftsmanship and fewer rework/punch items. Fewer rework/punch items often result in fewer schedule delays, costs, and unnecessary movement of the trades.

3. Enhances Problem Detection

Problems, anomalies, and issues are easy to identify in the visual organization of TTP. TTP highlights what needs to be done and what stands in the way of completing those tasks (Frandsen et al., 2014). As problems are detected earlier, in what is known as a ‘Make Ready Process’ (MRP), a culture to address issues before they become a problem is established (Frandsen, 2019). An increased standard of accountability for all members of the project reinforces the practice of early problem identification and remediation.

4. Establishes Accountability

As TTP clearly outlines the work/trade/logistical flows, trade partners can be held accountable for material procurement, adequate worker counts, and meeting the established production outputs. Because of the increased transparency in the construction process, for all parties, (Dlouhy et al., 2016) the general contractor can track the project’s progress and review key indicators with their trade partners to identify shortcomings and encourage improvement and ownership.

5. Reinforces Healthier Project Durations

TTP is based upon mathematical production equations and production laws (Tommelein et al., 2022). These laws and principles (combined with the implementation of buffers/pull planning/levelling/packaging) create realistic project durations that can be held and maintained. Through the optimization that comes from the production laws and principles, the overall project duration can be reduced significantly. In a recent case study, TTP was able to reduce the, “planned and actual construction durations up to ~70% of the total work days” (Apgar et al., 2023).

6. Reduces Waste

The construction industry is a big culprit when it comes to waste. The industry often struggles to fully conceptualize the true extent of the waste that it generates (Viana et al., 2012). Typical forms of construction waste include material, time,

and money. Excessive material inventory and storage on jobsites, is one common predecessor to waste generation. Time can be wasted as workers spend extra time sifting through materials in order to find the right material and/or because of improper staging they will spend extra time moving materials around in order to gain access to the needed materials. Waste of material can occur because materials are more likely to become damaged, stolen, or temporarily lost amongst the other materials and/or materials are thrown away more readily because of the natural perception that there is still plenty of available material. Excessive material storage often results in waste of financial resources as it costs money to remedy damaged, stolen, or misplaced materials. Additionally, extra man hours are needed to organize/find/access materials. TTP enables contractors to enforce 'just in time' delivery. This ultimately increases worker productivity, supports jobsite cleanliness, and decreases project waste. (Kujansuu et al., 2020) When materials arrive only when needed, variability is decreased and the stability of the production is increased (Haghsheno et al., 2016).

7. Increases Jobsite Organization/Cleanliness

TTP is a location-based schedule. At times, project managers will arrange for multiple trades to work in the same area at the same time. However, TTP can be used to sequence trades to flow from one area to the next and in such a manner that the trades are never working in the same area as another trade. Therefore, each trade is solely accountable and responsible for the zone (area) they are in. As such, trades can be kept accountable for maintaining jobsite cleanliness in their work areas. This is often done through a lean process referred to as the 5S's. Clean and organized workplaces have been proven to increase productivity and better the work environment (Sanchez et al., 2023). Clutter wastes time and hinders standardization. Clean jobsites not only help improve safety and satisfaction (for both the builders and those that have commissioned the building) but also improve productivity. Jobsite cleaning methods, such as composite cleans, will become unnecessary to implement.

8. Enhances Communication and Organization

TTP schedules are easy to understand and interpret. As TTP gives the fieldcraft a transparent view of production, they will always understand where they should be working (Kujansuu et al., 2020). When TTP schedules are communicated, on a daily basis (with every trade partner), cohesion and coordination are greatly improved, unlocking the energy and potential of a unified team (Wandahl et al., 2023). Because the trade partners are equipped with the knowledge of what needs to be done and where, they can think and act for the benefit of the project as a whole.

LIMITATIONS OF TTP

It is important to note that several studies have recorded issues arising in projects utilizing TTP (Kujansuu et al., 2020). One such paper, reported that workers felt an increased amount of stress when TTP was implemented because of stricter timelines and workflows (Frandsen et al., 2015). Another paper noted that while TTP results in greater efficiency, a failure to identify realistic construction rates resulted in significant schedule delays (Binniger et al., 2019; Apgar et al., 2023). While these types of papers cast some doubt on the effectiveness of TTP, other research papers have provided seemingly contradictory findings (Kujansuu et al., 2020).

Any methodology that improves time management, when implemented correctly, will likely have a positive impact upon work-life balance (ie the Last Planner® System). TTP is not the exclusive solution to improving work-life balance. However, the preponderance of research has

found that implementation of TTP can be successful and is beneficial to the various parties involved in construction projects. In one study, where a Norwegian contractor had tested TTP on several of their projects, the employees were asked at project completion if they would be interested in using TTP on future projects. “They were unanimously positive, and wanted to contribute to making it work better. They realized that in order for TTP to work it is essential that everyone got on board with it...” (Vatne et al., 2016, p. 180). In addition to the importance of getting all parties engaged and bought in on the adaption of TTP, there are several other conditions that must be met before the implementation of TTP will be successful (Apgar et al., 2023). This includes appropriating proper efforts toward planning before the project commences and then dedication to monitoring, controlling, and making continuous improvements/adjustments during the execution of the project (Lehtovaara et al., 2022). Like implementing any new practice, one must expect a period of adjustment as project teams become familiar with the new processes and iron out the initial kinks. With time, the unfamiliar will transform into familiarity, and the adoption of TTP can be successful - leading to enhanced project efficiency and success.

WORK-LIFE BALANCE AND FAMILY LIFE

Maintaining a good work-life balance is a well-researched topic amongst government and educational institutions. Research by the Australian Government found that long hours of work have serious negative effects on the institution of the family, relationships, and society (Pocock, 2001). Research conducted by members of the University of Maryland concluded that “...regardless of how flexible employees’ schedules were or how much responsibility they bore for home and family duties, the more hours a week they worked, the more work interference with family they reported” (Major et al., 2002, p. 434). Research suggests that long work hours are related to increased conflicts at the home, the workplace, and indirectly to psychological distress.

When a proper work-life balance is established and maintained, individuals have an increased ability to be healthy and productive in all areas of their lives. Identifying the ideal allocation of hours needed in order to establish a work-life balance is difficult to do. However, the general principle is that a surfeit amount of time spent at work will interfere with one’s private life and vice versa, an excess amount of time spent in one’s private life will interfere with work.

Maintaining a work-life balance is essential in preserving familial relationships and in the positive development of future generations. In a study submitted to the Queensland Department of Industrial Relations, the authors noted that long working hours restrict the number of hours that parents can spend with their children which may have a negative impact upon the emotional and intellectual development of the child (Pocock, 2001). The family is the basic unit and building block of society. Research has found that good family relationships aid parents when coping with stress, seeking to develop healthier habits, and/or growing their self-esteem (Thomas et al., 2017). As such, preserving a healthy family life is a worthwhile endeavor that ensures that individuals, communities, and nations will flourish and thrive.

Maintaining a work-life balance is also important for the individual. Hobbies, exercise, recreation, and personal/decompression time are all dependent on a work-life balance. Individuals who are able to pursue these aspects and areas of their lives will find that they will have more motivation, energy, focus, and patience at work. In the United Kingdom, sixty-one companies participated in a four-day working week pilot program. Out of the sixty-one companies that participated, fifty-six companies (92%) decided to continue the four-day work week after the pilot program had ended. Companies found that while business performance and productivity were maintained, their employees reported significant declines in burnout, stress, anxiety, fatigue, and improved mental and physical health (Frayne, et al., 2023). TTP benefits

may have the potential to allow for the implementation of a four-day work week in the construction industry.

TTP AND AN IMPROVED WORK-LIFE BALANCE

The implementation of TTP in construction scheduling not only enhances project efficiency but it also likely plays a pivotal role in establishing a healthier work-life balance for construction professionals. As the relationship between TTP and an improved work-life balance has not yet been studied by researchers, at this time it is not possible to confirm such a correlation. Given the existing body of knowledge, it is possible to identify causality between effective time management and an improved work-life balance.

One of the fundamental reasons for the potential correlation, between TTP and an enhanced work-life balance, lies in TTPs ability to establish realistic and sustainable durations for project schedules. The careful planning and allocation of resources, through TTP methods, minimizes the likelihood of unforeseen delays and disruptions. TTP thereby reduces the likelihood that construction professionals will need to work extended hours to recover lost time. TTP helps project teams to focus on the important/nonurgent tasks before they become important/urgent (Refer to Figure 1). This proactive approach to project management helps foster a more stable work environment, enabling project teams to have the ability to allocate time towards their personal and family commitments.

Furthermore, TTP encourages an effective communication and accountability framework throughout the lifecycle of the project. Effective communication and coordination are crucial for addressing issues promptly. These efforts help avoid any last-minute crises that will often result in construction professionals working extended hours. The open lines of communication and coordination that are facilitated by TTP foster an engaging work environment, where everyone on the project is aware of the needs of the project and is empowered to identify and think through potential issues. This proactive approach to identifying problems allows for problems to be resolved before they are compounded and push project milestones to the right.

Taking into account the various advantages that TTP brings to the table, such as project optimization and efficiency, one can begin to see how TTP fosters an environment and culture that directly contributes to the improved well-being of project teams.

CURRENT TTP TRENDS

As mentioned in the introduction, presently, TTP is an underutilized project management tool. This is unfortunate as TTP serves as a leukocyte that defends against project pathogens which lay dormant but, because of ineffective construction practices and error, often arise to wreak havoc upon projects and their teams (Love et al., 2009). While TTP has been growing in popularity, especially in European countries like Germany, (Haghsheno et al., 2016) it seems that the majority of contractors in the United States have yet to fully embrace the adoption of TTP as a standard practice in their means and methods. This includes all areas of construction: residential, commercial, industrial, heavy civil, etc. As many construction projects fall short of the project objectives, there is a need for contractors to more fully adopt and implement lean construction methods like TTP (Högnabba, 2021).

ADDITIONAL BENEFITS OF TTP

Researchers have recently begun studying mental health in the construction industry. One such researcher noted that, “The construction industry is particularly vulnerable to mental health issues, as the [construction] environment contains many occupational stressors such as: high production pressures, dangerous work, [and] complex decision-making” (Sherratt et al., 2018; Oswald et al., 2019, p. 1050). As mental health and well-being have been linked to a healthy work-life balance, TTP will likely emerge a critical tool in future efforts to improve the mental health and well-being of individuals in the construction industry.

In the same manner of increasing accountability between the general contractor and their trade partners, TTP also has the potential to improve the accountability between the contractors and the project owners. Research has found that, “Negotiating a fair and concise contract minimizes ambiguities and consequently, reduces disputes. As such, the contract serves as both sword and shield - a sword to enforce action and compliance when necessary, and a shield to prevent straying from agreed work scope and obligations” (Ottesen et al., 2015, p. 4). TTP both sharpens the sword and hardens the shield. Schroeder highlighted this when he wrote, “Unaccountable people, teams, and companies want roadblocks hidden so they can more easily transfer blame and costs. Accountable people, teams, and companies will love Takt planning and knowing the truth in bringing roadblocks to the surface so we can manage around them as a team...” (Schroeder et al., 2021, p. 13). TTP brings to light the actions (or inactions) of the party that interrupted the project’s flow and caused a delay in schedule and/or an increase to the project’s cost. TTP encourages all parties to collaborate in a Make Ready Process so that roadblocks and issues can be identified and addressed before they become a problem. This ultimately shifts project teams from reacting to crises (quadrant one) to being proactive and focused on the tasks of quadrant two.

CONCLUSION

While conducting a comprehensive review of existing research on Takt Time Planning, the authors identified eight core benefits associated with its implementation. Although the benefits of TTP have been well-documented, there is a notable gap in academic research concerning the positive effects that TTP has on individuals, families, and work-life balance. Establishing a direct connection between TTP and the assumed benefits of improved personal/family life and work-life balance is challenging due to the numerous external factors. However, as further research is conducted and data is collected, a compelling argument will likely be constructed that links reduced working hours (from the use of TTP) to an enhanced family life and work-life balance. A carefully designed survey conducted on subjects using TTP, to its capabilities, will likely find a reduction in normal working hours. Further research could then confirm any correlation between TTP and the improved well-being of individuals and families who are involved in projects utilizing TTP. As developers, owners, investors, general contractors, trade partners, and members of the construction industry in positions of influence and power better understand the implications of adopting Takt Time Planning for their employees and those in their stewardship, it is the hope of the authors that they will see TTP as an essential component of effective project management and adopt it into their standard operating procedures and contracts.

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